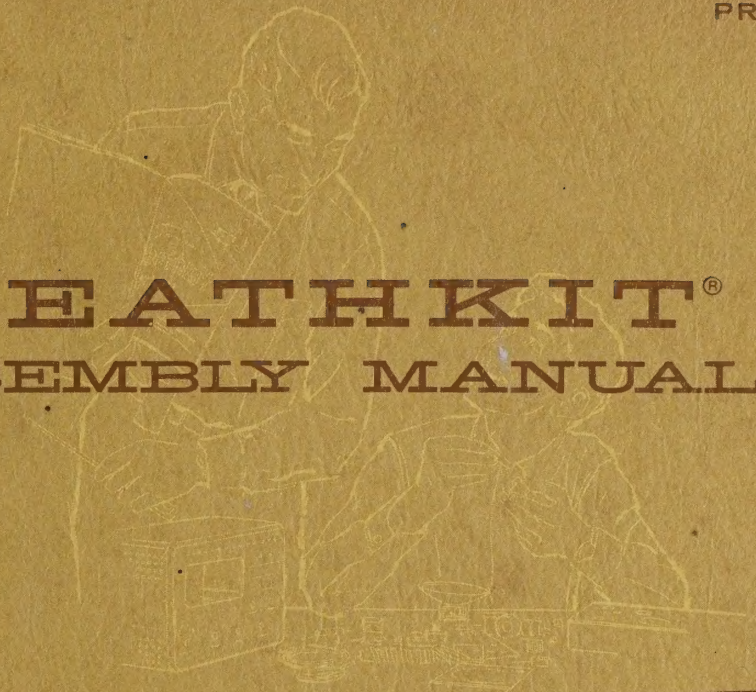
PRICE $2.00

HEATH COMPANY
BENTON HARBOR MICHIGAN

HEATHKIT®
ASSEMBLY MANUAL



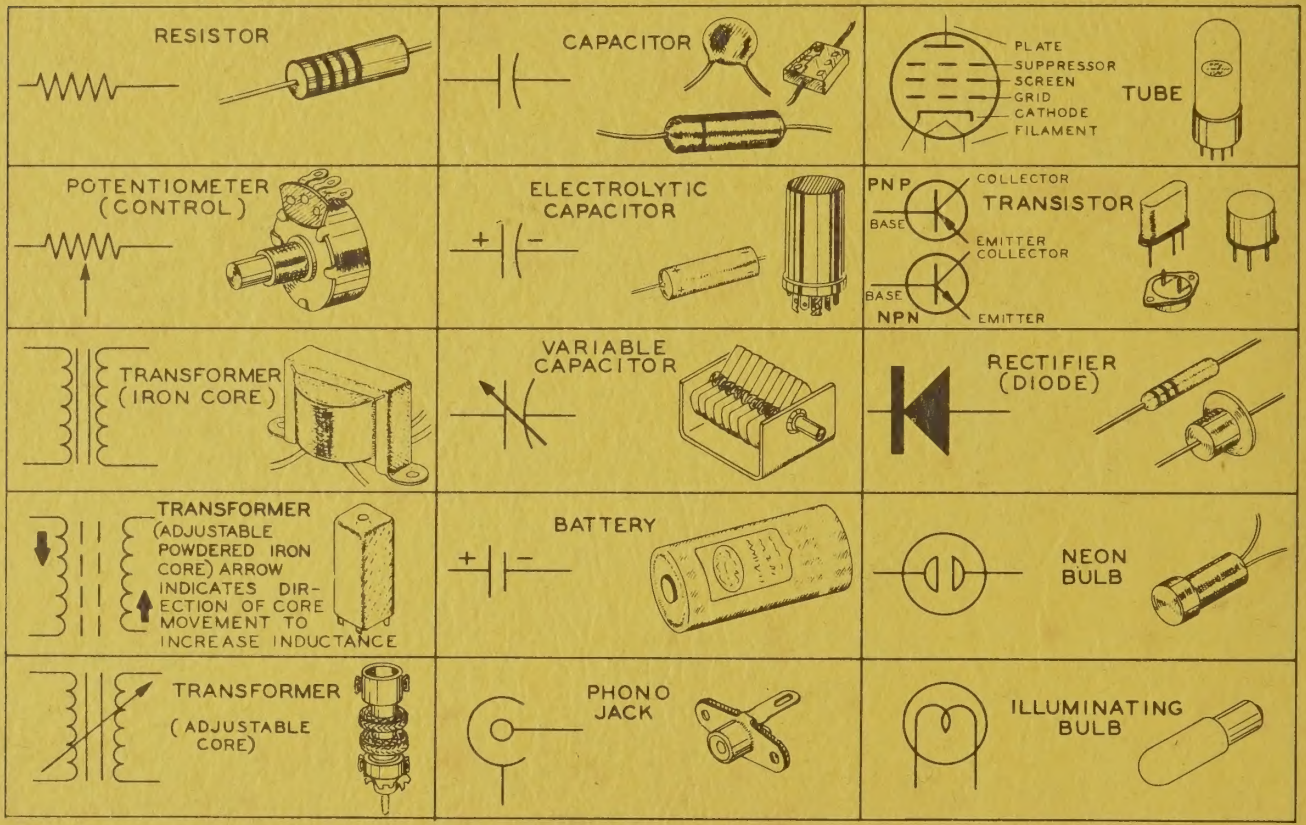
HEATHKIT®

2-METER CONVERTER

MODEL SBA-300-4

TYPICAL COMPONENT TYPES

This chart is a guide to commonly used types of electronic components. The symbols and related illustrations should prove helpful in identifying most parts and reading the schematic diagrams.



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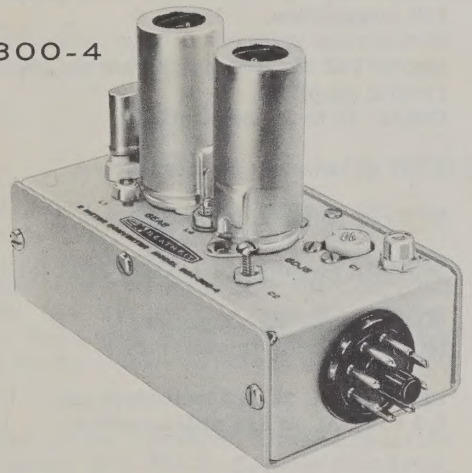
Assembly and Operation of the

HEATHKIT

2-METER CONVERTER

MODEL SBA-300-4



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HEATH COMPANY

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SPECIFICATIONS

Sensitivity. . . . . (Signal plus noise-to-noise in db)	AM: Less than 0.2 microvolt for 6 db at 3750 cps bandwidth SSB: Less than 0.2 microvolt for 12 db at 2100 cps bandwidth CW: Less than 0.2 microvolt for 20 db at 400 cps bandwidth (Using Heathkit SB-300 Receiver.)
Noise Figure.	7 db or less.
Bandpass.	Essentially flat over any 2 megacycle segment from 142 to 150 megacycles.
Frequency.	Input: 142 to 150 megacycles (144 to 146 megacycles with crystal supplied). Output: 28 to 30 megacycles.
Image Rejection.	80 db or better at 88 megacycles.
IF Rejection.	50 db or better at 29 megacycles.
Crystal.	38.66666 megacycles ±.003%, 3rd overtone.
Tube Complement.	6DJ8 cascode RF amplifier. 6EA8 oscillator-tripler-mixer.
Power Requirements.	130 volts DC at 12.5 milliamperes. 6.3 volts AC at 815 milliamperes.

Dimensions	Overall: 2-5/8" wide x 5-3/4" long x 3-3/4" high.
Net Weight	10-1/2 oz.
Test Equipment Used In Preparing Specifications Measurements, And Alignment Instructions	Measurements Corporation Model 80 Standard Signal Generator (with 50 Ω pad). Heathkit Model IM-13 Vacuum Tube Voltmeter.

The Heath Company reserves the right to discontinue instruments and to change specifications at any time without incurring any obligation to incorporate new features in instruments previously sold.

INTRODUCTION

The Heathkit Model SBA-300-4, 2-Meter Converter is designed to extend the frequency coverage of the Heathkit SB-300 Receiver to include 142 to 150 megacycles (144 to 146 megacycles with the 38.66666 megacycle crystal supplied). The Converter receives its filament, B+, and AGC voltages from the receiver through a power cable. The power cable connections for the Converter are switched by the Converter switch in the SB-300 Receiver.

A separate power socket on the Converter chassis provides power for the Heathkit Model SBA-300-3, 6-Meter Converter. Either one or both of these converters can be mounted on the rear of the SB-300 Receiver cabinet for a neat, easy installation.

The Converter circuit consists of a cascode RF amplifier, a crystal-controlled oscillator-tripler, and a mixer stage. The 2-stage RF amplifier provides low noise, plus excellent sensitivity characteristics; the crystal-controlled oscillator provides drift-free operation.

Although this Converter is designed for use with the Heathkit SB-300 Receiver, it can be used equally well with any other receiver that has similar characteristics and tunes from 28 to 30 megacycles.

The SBA-300-4 Converter and SB-300 Receiver combination provides high-sensitivity, high-stability, and low-noise VHF reception of AM, SSB, and CW signals in the 2-meter band.

CIRCUIT DESCRIPTION

Refer to the Schematic Diagram while reading the following Circuit Description.

CASCODE RF AMPLIFIER

Tube stages V1A and V1B are connected as an untuned cascode RF amplifier; V1A is a grounded-cathode stage, and V1B is a grounded-grid stage. The signal from the antenna is coupled across image trap coil L1, input coil L2, and through coupling capacitor C3 to the grid of tube V1A. Image trap coil L1 is adjusted to reject signals at 88 megacycles, while allowing the desired operating frequencies to pass. Input coil L2 is tapped to provide a 50 Ω antenna input impedance.

In tube V1A, the signal is amplified and then coupled to the cathode of tube V1B through L_N. Tube stage V1A is neutralized by L_N for optimum signal-to-noise ratio. After further amplification in V1B, the signal is coupled through bandpass coils L3 and L4. These coils are placed physically close together so they operate as a transformer; L3 serves as the primary and L4 as the secondary of the transformer. This circuit presents a high impedance to 143-149 megacycle signal frequencies, and is almost a short circuit to any other received signal frequencies that may be amplified by the cascode RF amplifier.

MIXER-OSCILLATOR-TRIPLER

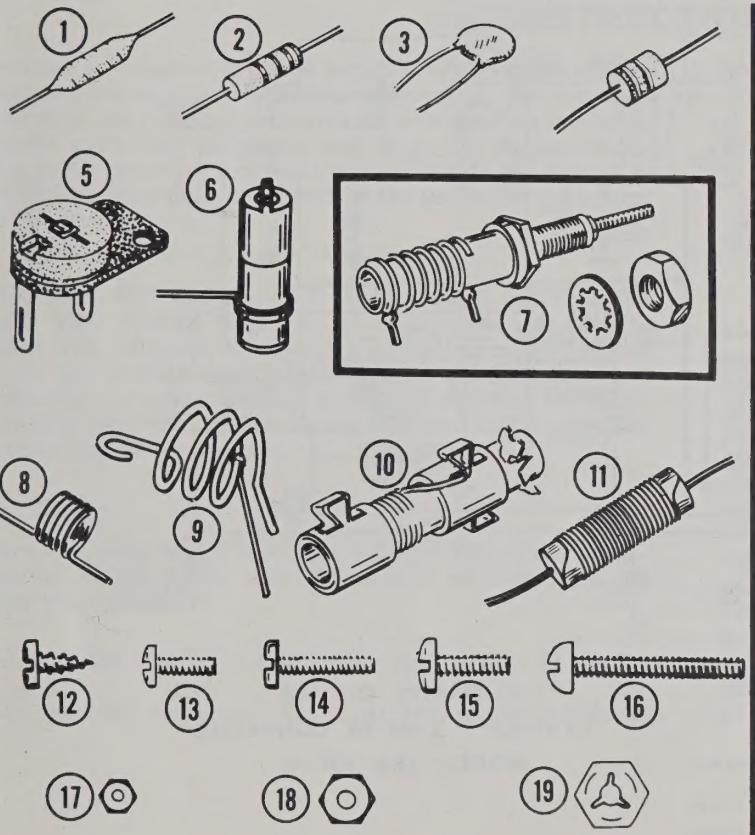
The signal from coil L4 is directly coupled to the grid of tube V2A, which is used as a low-noise mixer. The oscillator signal from V2B is also applied to the grid of mixer V2A. The incoming signal frequency and the oscillator frequency are mixed in V2A to produce an IF signal (28 to 30 megacycles). The plate circuit of V2A is tuned to the 29 megacycle IF midpoint by capacitor C10 and coil L5. The IF signal is coupled from coil L5 to the receiver antenna input by a link winding on coil L5. This coil provides a 50 Ω output impedance to match the receiver antenna input impedance.

Tube V2B is a crystal-controlled oscillator stage. The grid and screen circuits of V2B form the oscillator. A 38.6666 megacycle 3rd overtone crystal, coil L6, and capacitor C14 control the oscillator frequency. The plate circuit is tuned to the third harmonic of the crystal frequency by coil L7 and capacitor C15. This 115.999 megacycle signal is coupled through capacitor C9 to the grid of mixer tube V2A. (The 38.66666 megacycle crystal provides coverage between 144 and 146 megacycles. A 38, 39.333, or 40 megacycle crystal may also be used to cover 2 megacycle segments below and above the 144 to 146 megacycle range.)

POWER

Filament, B+, and AGC voltages are provided by the receiver through a cable assembly. The VHF No. 1 position of the SB-300 Receiver Converter switch applies power to the Converter through lugs 6 and 8 of the plug and socket. In the VHF No. 2 position, power is applied through lugs 1 and 3 of the octal plug and socket for use with a 6-Meter Converter. AGC voltage is applied through lug 4 and is not switched.

PARTS PICTORIAL



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CONSTRUCTION NOTES

This manual is supplied to assist you in every way to complete your kit with the least possible chance for error. The arrangement shown is the result of extensive experimentation and trial. If followed carefully, the result will be highly stable and dependable performance. We suggest that you retain the manual in your files for future reference, both in the use of the equipment and for its maintenance.

UNPACK THE KIT CAREFULLY AND CHECK EACH PART AGAINST THE PARTS LIST. In so doing, you will become acquainted with the parts. Refer to the information on the inside covers of the manual to help you identify the components. If some shortage or parts damage is found in checking the Parts List, please read the Replacements section and supply the information called for therein.

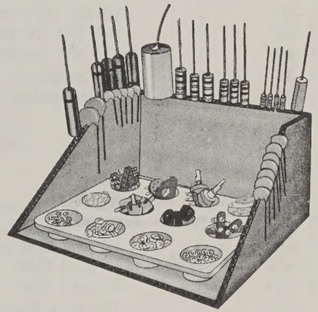
Resistors generally have a tolerance rating of 10% unless otherwise stated in the Parts List. Tolerances on capacitors are generally even greater.

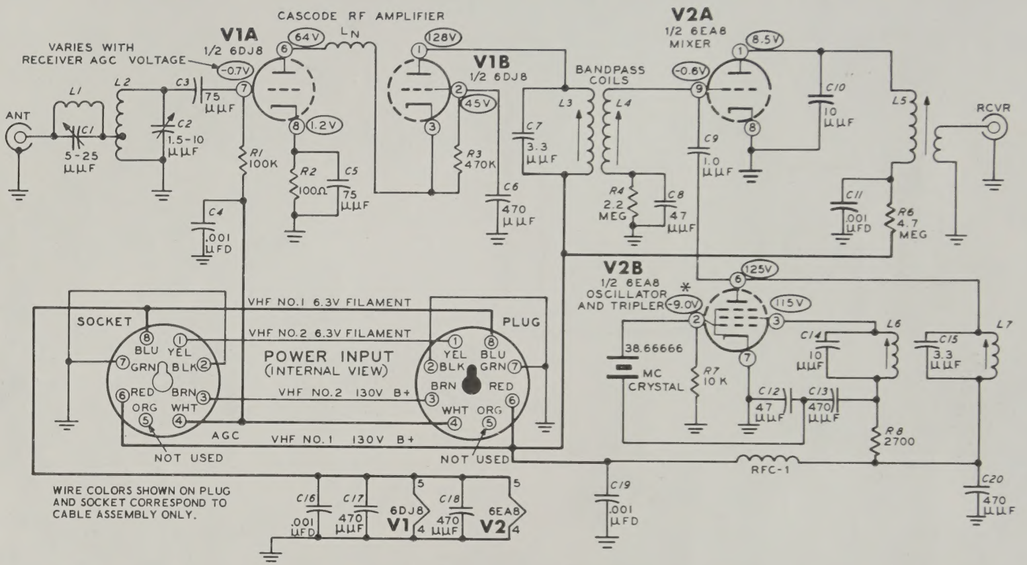
We suggest that you do the following before work is started:

1. Lay out all parts so that they are readily available.

2. Provide yourself with good quality tools. Basic tool requirements consist of a screwdriver with a 1/4" blade; a small screwdriver with a 1/8" blade; long nose pliers; wire cutters, preferably separate diagonal cutters, a penknife or a tool for stripping insulation from the wires; and a soldering iron (or gun). A set of nut drivers and a nut starter, while not necessary, will aid extensively in construction of the kit.

Most kit builders find it helpful to separate the various parts into convenient categories. Muffin tins or molded egg cartons make convenient trays for small parts. Resistors and capacitors may be placed with their lead ends inserted in the edge of a piece of corrugated cardboard until they are needed. Values can be written on the cardboard next to each component. The illustration shows one method that may be used.





NOTES:

ALL RESISTORS ARE 1/2 WATT.
ALL RESISTOR VALUES ARE IN OHMS (K = 1000, MEG = 1,000,000).
( ) INDICATES VOLTAGE READING.
ALL VOLTAGES ARE DC POSITIVE UNLESS MARKED OTHERWISE.
ALL VOLTAGES ARE MEASURED FROM POINT INDICATED TO CHASSIS GROUND AND MAY VARY ±10%.
VOLTAGE READINGS TAKEN WITH AN 11 MEGOHM VTVM, WITH NO SIGNAL INPUT.
POWER INPUT LINES LABLED VHF NO. 2 RECEIVE POWER WHEN RECEIVER CONVERTER SWITCH IS IN VHF NO. 2 POSITION.
POWER INPUT LINES LABLED VHF NO. 1 RECEIVE POWER WHEN RECEIVER CONVERTER SWITCH IS IN VHF NO. 1 POSITION.
* VARIES WITH CRYSTAL ACTIVITY.

SCHEMATIC OF THE
HEATHKIT® 2-METER CONVERTER
MODEL SBA-300-4

PARTS LIST

The numbers in parentheses in the Parts List are keyed to the numbers on the Parts Pictorial to aid in parts identification.

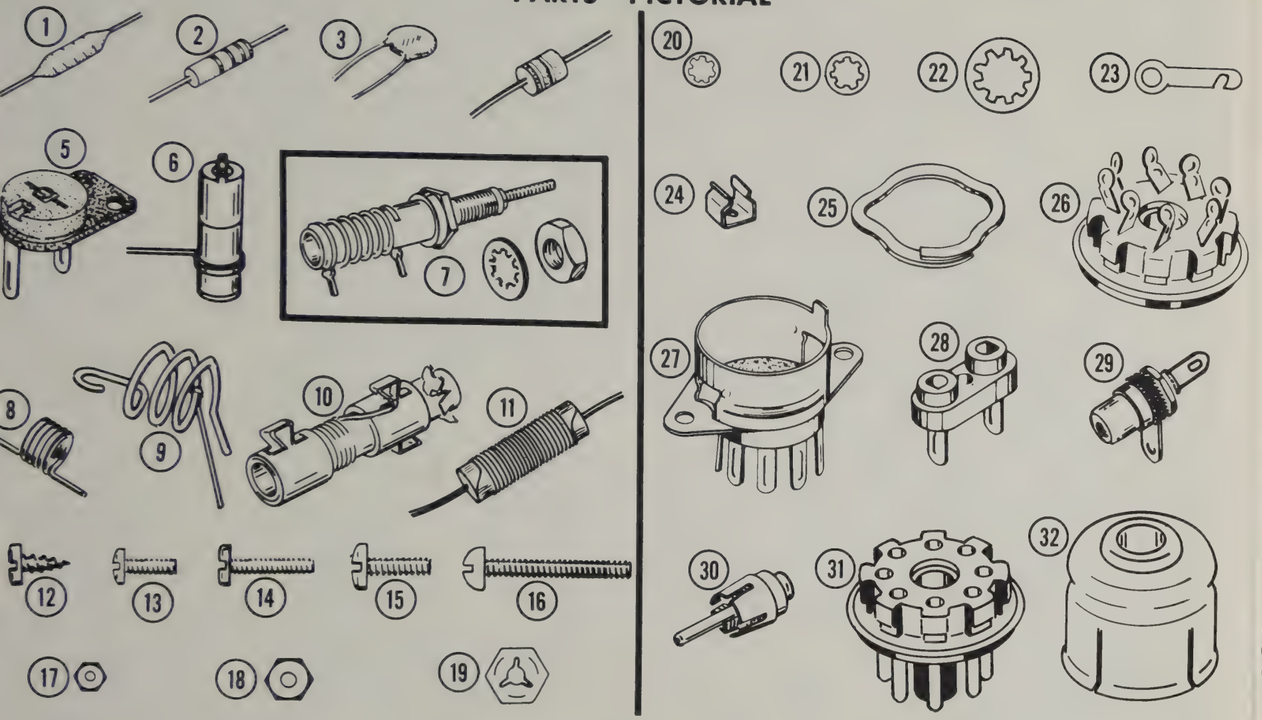
PART No.	PARTS Per Kit	DESCRIPTION
RESISTORS-1/2 WATT		
(1) 2-149	1	.900 Ω precision
(2) 1-3	1	100 Ω (brown-black-brown)
1-13	1	2700 Ω (red-violet-red)
1-20	1	10 KΩ (brown-black-orange)
1-26	1	100 KΩ (brown-black-yellow)
1-33	1	470 KΩ (yellow-violet-yellow)
1-37	1	2.2 megohm (red-red-green)
1-39	1	4.7 megohm (yellow-violet-green)
CAPACITORS		
(3) 21-33	2	3.3 μμf disc
21-3	2	10 μμf disc
21-32	2	47 μμf disc
21-54	2	75 μμf disc
21-56	5	470 μμf disc
21-14	4	.001 μfd disc
(4) 28-2	1	1.0 μμf tubular (brown-black-white)
(5) 31-17	1	5-25 μμf trimmer
(6) 31-21	1	1.5 - 10 μμf ceramic trimmer

PART No.	PARTS Per Kit	DESCRIPTION
COILS		
(7) 40-203	2	Bandpass (with lockwasher and nut)
(8) 40-209	1	Image trap
(9) 40-326	1	RF
(10) 40-612	1	Multiplier
40-622	1	Oscillator
40-623	1	Output
(11) 45-37	1	Choke
HARDWARE		
Screws		
(12) 250-170	6	#6 x 1/4" sheet metal
(13) 250-49	7	3-48 x 1/4"
(14) 250-133	1	3-48 x 7/16"
(15) 250-89	2	6-32 x 3/8"
(16) 250-134	1	6-32 x 3/4"
Nuts		
(17) 252-1	8	3-48
(18) 252-3	2	6-32
(19) 252-19	1	6-32 palnut

PART No.	PARTS Per Kit	DESCRIPTION
Lockwashers		
(20) 254-7	14	#3
(21) 254-1	2	#6
(22) 254-14	2	1/4"
Miscellaneous		
(23) 259-6	5	#6 solder lug
(24) 260-29	1	Crystal clip
(25) 435-1	2	Mounting ring
WIRE-CABLES		
344-59	1	Hookup wire
347-1	1	8-wire cable
343-2	1	Shielded cable
CRYSTAL-TUBES		
404-250	1	38.66666 mc crystal
411-124	1	6EA8 tube
411-208	1	6DJ8 tube

PART No.	PARTS Per Kit	DESCRIPTION
TERMINAL STRIP-SOCKETS-PLUGS		
431-49	1	11-lug terminal strip
(26) 434-4	2	Octal socket
(27) 434-36	2	9-pin tube socket
(28) 434-74	1	Crystal socket
(29) 434-107	2	Phono socket
(30) 438-4	3	Phono plug
(31) 438-6	2	Octal plug
MISCELLANEOUS		
206-3	2	Tube shield
261-4	4	Rubber feet
200-420-2	1	Chassis
201-32	1	Chassis base
(32) 440-1	2	Octal plug cap
490-1	1	Alignment tool
331-6		Solder
595-712	1	Manual

PARTS PICTORIAL



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PROPER SOLDERING TECHNIQUES

Only a small percentage of customers find it necessary to return equipment for factory service. By far the largest portion of malfunctions in this equipment are due to poor or improper soldering.

If terminals are bright and clean and free of wax, frayed insulation and other foreign substances, no difficulty will be experienced in soldering. Correctly soldered connections are essential if the performance engineered into a kit is to be fully realized. If you are a beginner with no experience in soldering, a half hour's practice with some odd lengths of wire may be a worthwhile investment.

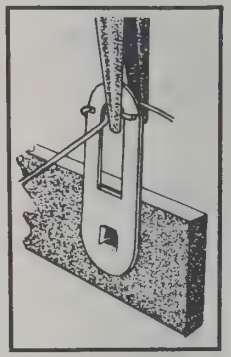
For most wiring, a 25 to 100 watt iron or its equivalent in a soldering gun is very satisfactory. A lower wattage iron than this may not heat the connection enough to flow the solder smoothly. Keep the iron tip clean by wiping it from time to time with a cloth.

CHASSIS WIRING AND SOLDERING

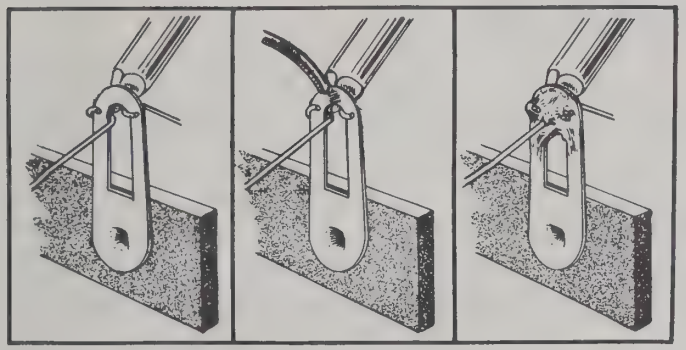
1. Unless otherwise indicated, all wire used is the type with colored insulation (hookup wire). In preparing a length of hookup wire, 1/4" of insulation should be removed from each end unless directed otherwise in the assembly step.

3. Leads on resistors, capacitors, and similar components are generally much longer than need be to make the required connections. In these cases, the leads should be cut to proper length before the part is installed. In general, the leads should be just long enough to reach their terminating points.

4. Crimp or bend the lead (or leads) around the terminal to form a good joint without relying on solder for physical strength. If the lead is too large to allow bending or if the step states that it is not to be crimped, position it so that a good solder connection can still be made.



5. Position the work, if possible, so that gravity will help to keep the solder where you want it.



6. Place a flat side of the soldering iron tip against the joint to be soldered until it is heated sufficiently to melt the solder.

7. Then place the solder and it will immediately flow over the joint; use only enough solder to thoroughly wet the junction. It is usually not necessary to fill the entire hole in the terminal with solder.

8. Remove the solder and then the iron from the completed joint. Use care not to move the leads until the solder is solidified.

A poor or cold solder joint will usually look crystalline and have a grainy texture, or the solder will stand up in a blob and will not have adhered to the joint. Such joints should be reheated until the solder flows smoothly. In some cases, it may be necessary to add a little more solder to achieve a smooth, bright appearance.

NOTE: ALL GUARANTEES ARE VOIDED AND WE WILL NOT REPAIR OR SERVICE EQUIPMENT IN WHICH ACID CORE SOLDER OR PASTE FLUXES HAVE BEEN USED. WHEN IN DOUBT ABOUT SOLDER, IT IS RECOMMENDED THAT A NEW ROLL PLAINLY MARKED "ROSIN CORE RADIO SOLDER" BE PURCHASED.

STEP-BY-STEP PROCEDURE

The following instructions are presented in a logical step-by-step sequence to enable you to complete your kit with the least possible confusion. Be sure to read each step all the way through before beginning the specified operation. Also read several steps ahead of the actual step being performed. This will familiarize you with the relationship of the subsequent operations. When the step is completed, check it off in the space provided. This is particularly important as it may prevent errors or omissions, especially if your work is interrupted. Some kit builders have also found it helpful to mark each wire and part in colored pencil on the Pictorial as it is added.

ILLUSTRATIONS

The fold-out diagrams in this manual may be removed and attached to the wall above your working area; but because they are an integral part of the instructions, they should be returned to the manual after the kit is completed.

In general, the illustrations in this manual correspond to the actual configuration of the kit; however, in some instances the illustrations may be slightly distorted to facilitate clearly showing all of the parts.

SOLDERING

The abbreviation "NS" indicates that a connection should not be soldered yet as other wires will be added. When the last wire is installed, the terminal should be soldered and the abbreviation "S" is used to indicate this. Note that a number will appear after each solder instruction. This number indicates the number of leads that are supposed to be connected to the terminal in point before it is soldered. For example, if the instructions reads, "Connect a wire to lug 1 (S-2)," it will be understood that there will be two wires connected to the terminal at the time it is soldered. (In cases where a wire passes through a terminal or lug and then connects to another point, it will count as two wires, one entering and one leaving the terminal.)

STEP-BY-STEP ASSEMBLY

CHASSIS PARTS MOUNTING

Refer to Pictorial 1 (fold-out from Page 13) for the following steps.

NOTE: A plastic nut starter is provided for your convenience. Refer to the inside front cover of this manual for information on its use.

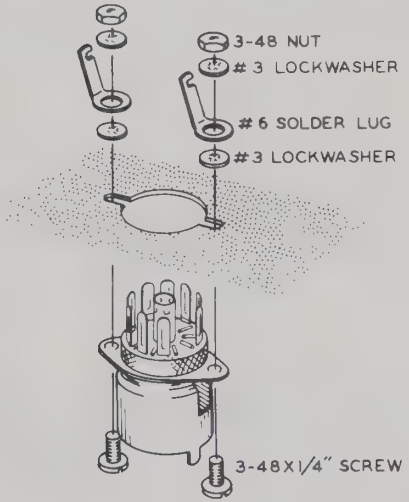
( ) Position the chassis as shown in the Pictorial.

( ) Mount a 9-pin tube socket at V1 and #6 solder lugs at L and M. Use 3-48 x 1/4" screws, #3 lockwashers, and 3-48 nuts as shown in Detail 1A. Position the wide space between the tube socket lugs as shown by the large arrow in Pictorial 1.

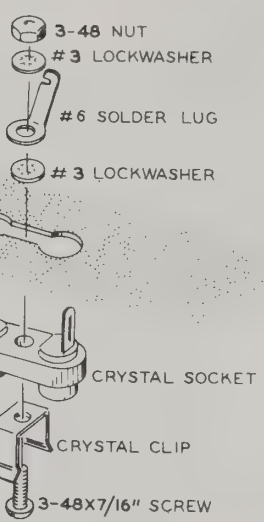
( ) Bend and solder lugs 4, 9, and solder lug L against the center post of the tube socket. Be careful not to fill the small holes in the center post with solder.

( ) Mount a 9-pin tube socket at V2 and a #6 solder lug at G. Use 3-48 x 1/4" screws, #3 lockwashers, and 3-48 nuts. Position the wide space between the tube socket lugs as shown by the large arrow in Pictorial 1. Also position solder lug G as shown.

( ) Bend and solder lugs 4, 7, and 8 against the center post of the tube socket. Be careful not to fill the small holes in the center post with solder.



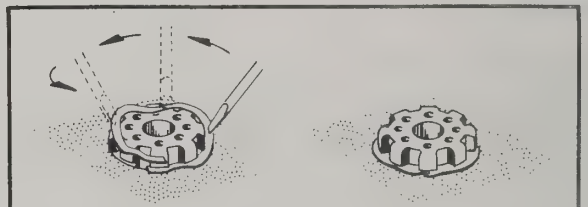
Detail 1A



Detail 1B

(l) Mount a crystal socket, with a crystal clip, and a #6 solder lug at C. Use a 3-48 x 7/16" screw, #3 lockwashers, and a 3-48 nut as shown in Detail 1B. Do not overtighten the hardware, as the crystal socket could be damaged.

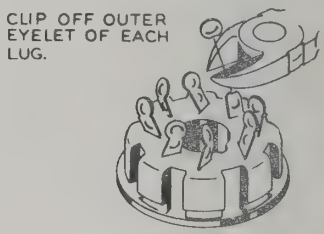
NOTE: In the following steps, be sure to position each part as shown in Pictorial 1.



Detail 1C

(k) Install an octal plug at S with a mounting ring, as shown in Detail 1C. Position the key as shown in the Pictorial.

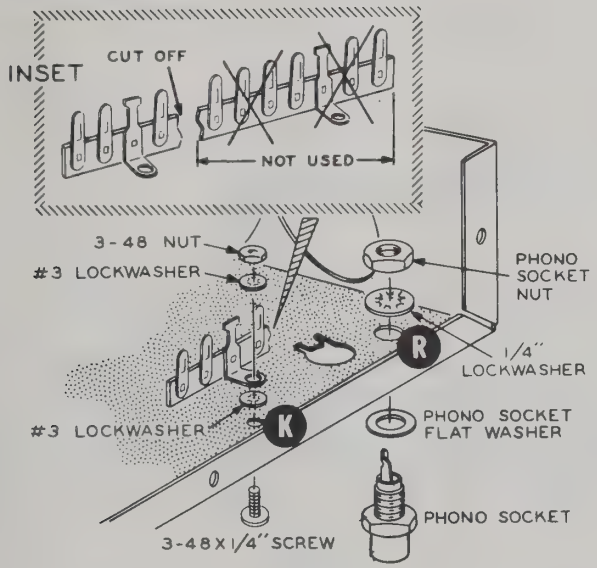
(j) Referring to Detail 1D, clip off the outer eyelet of each lug on either octal socket.



Detail 1D

(i) Mount this socket at A, using a mounting ring. Be sure to position the keyway as shown in the Pictorial.

(h) Locate the 11-lug terminal strip and cut it as shown in the inset drawing on Detail 1E. This terminal strip will be used as a 4-lug terminal strip in the following step.



Detail 1E

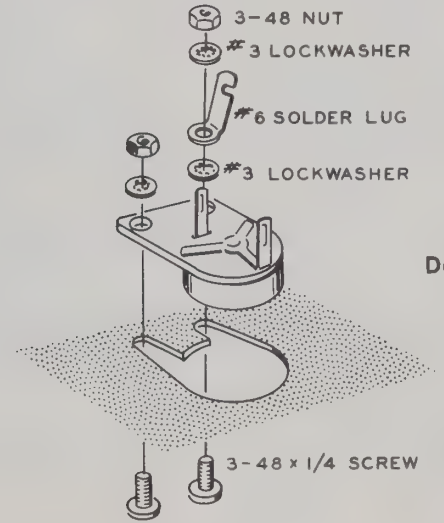
(✓) Referring to Detail 1E, mount the prepared 4-lug terminal strip at K. Use a 3-48 x 1/4" screw, #3 lockwashers, and 3-48 nut.

(✓) Remove and discard the solder lug on each of the two phono sockets.

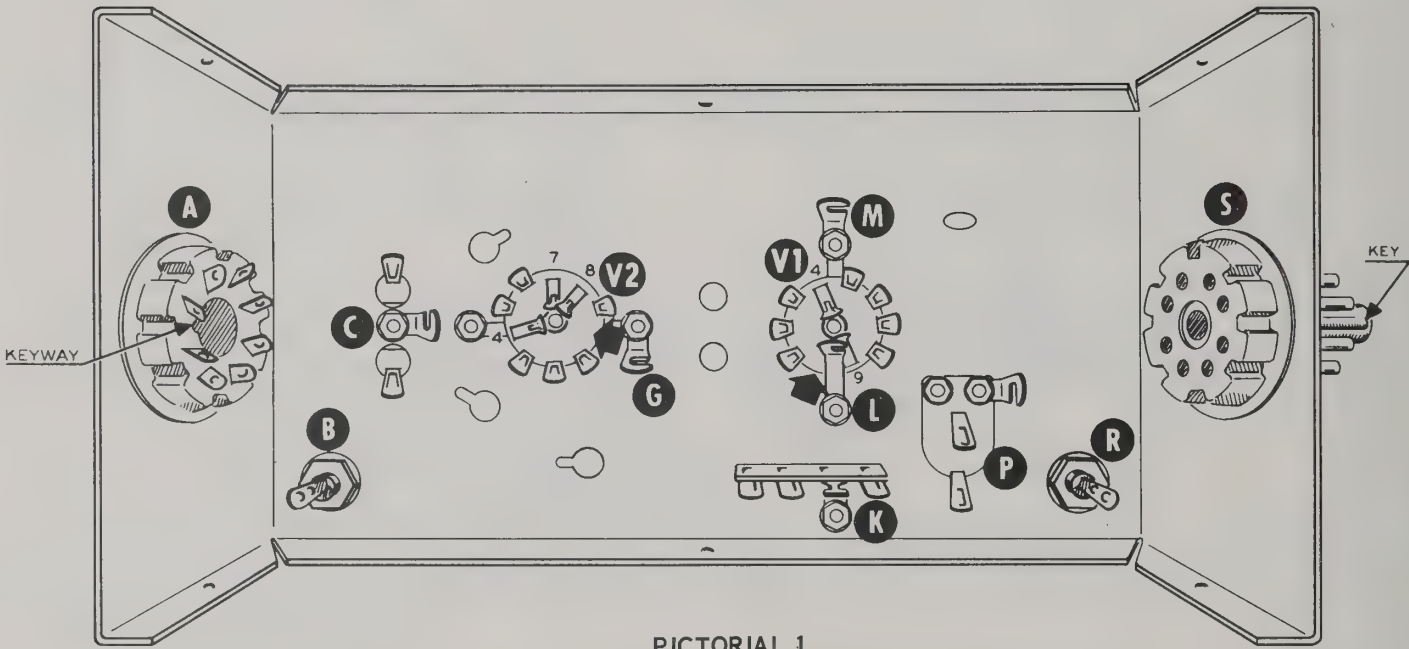
CAUTION: If pliers are used to hold the phono socket when tightening the nuts in the following step, be careful not to bend the socket and break the insulation.

(✓) Install phono sockets at B and R. Use a phono socket flat washer, a 1/4" lockwasher, and nut, for each socket as shown in Detail 1E.

(✓) Referring to Detail 1F, mount the 5-25 $\mu\mu$f trimmer capacitor at P. Use 3-48 x 1/4" screws, #3 lockwashers, one #6 solder lug, and 3-48 nuts. Position the solder lug as shown in the Pictorial.



Detail 1F



PICTORIAL 1

( ) Connect a 2-1/2" bare wire from pin 2 (S-1) to pin 7 (S-1) of octal plug S.

( ) Connect a 1" bare wire from the center of this bare wire (S-1) to lug 3 (solder lug) of trimmer capacitor P (NS).

( ) Connect a 1-1/2" bare wire from the center post of tube socket V2 (NS) to solder lug G (S-2). Do not cut off the excess lead coming from G.

( ) Connect a 47 $\mu\mu$f disc capacitor between lugs 1 (NS) and 2 (solder lug) (S-2) of crystal socket C.

( ) Connect a 470 KΩ (yellow-violet-yellow) resistor from lug 2 (NS) to lug 3 (NS) of tube socket V1. Be sure to position this resistor close to the tube socket as shown.

( ) Connect a .9 Ω precision resistor from lug 3 (S-2) to lug 6 (S-1) of tube socket V1. Position this resistor parallel to the chassis as shown.

( ) Connect a 75 $\mu\mu$f disc capacitor from lug 3 (solder lug) of trimmer capacitor P (NS) to lug 8 of tube socket V1 (NS).

( ) Connect a .001 μfd disc capacitor from lug 3 (NS) to lug 4 (NS) of terminal strip K.

( ) Connect a .001 μfd disc capacitor from lug 1 (NS) to lug 3 (NS) of terminal strip K.

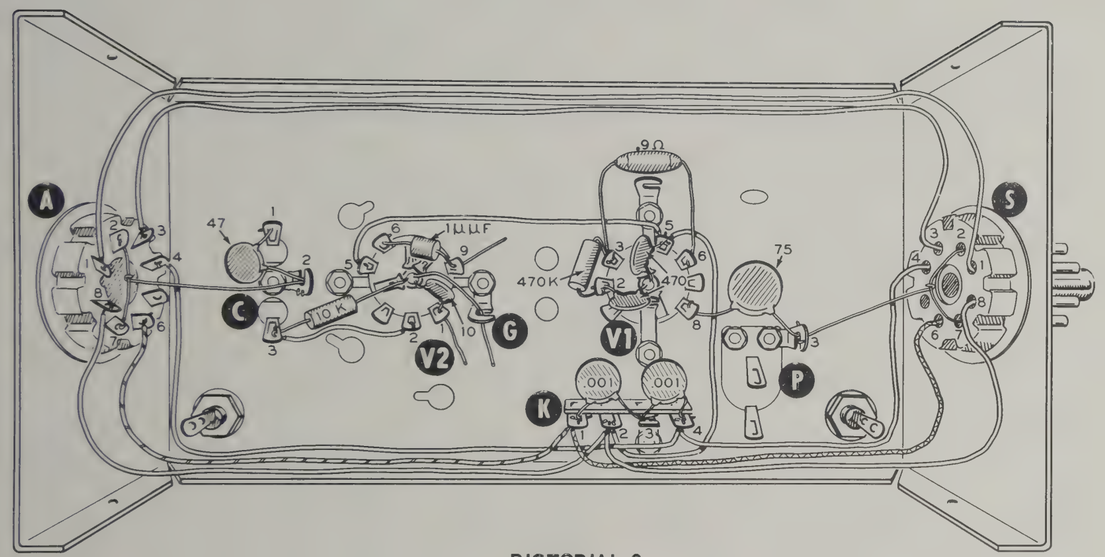
( ) Insert one lead of a 1 $\mu\mu$f (brown-black-white) tubular capacitor through lug 9 of tube socket V2 (S-2). Do not cut off the excess lead as it will be connected later. Connect the other lead of this capacitor to lug 6 of tube socket V2 (NS).

( ) Insert one lead of a 10 $\mu\mu$f disc capacitor through lug 1 of tube socket V2 (S-2). Do not cut off the excess lead as it will be connected later. Connect the other lead of this capacitor to the center post of tube socket V2 (NS).

( ) Connect a 10 KΩ (brown-black-orange) resistor from lug 3 of crystal socket C (S-2) to the center post of tube socket V2 (NS).

( ) Connect a 470 $\mu\mu$f disc capacitor from lug 2 (S-2) to the center post (NS) of tube socket V1.

( ) Connect a 470 $\mu\mu$f disc capacitor from lug 5 (S-3) to the center post (S-2) of tube socket V1. Be sure the two lugs and the #6 solder lug bent against the center post are also soldered.



PICTORIAL 2

WIRING

Refer to Pictorial 2 for the following step.

( ) Prepare the following lengths of hookup wire. Cut each wire to the length listed and remove 1/4" of insulation from each end. Keep the wires in the sequence listed, as this is the order in which they will be used.

3"	8-1/2"	4-1/2"	4-3/4"
2-3/4"	7-1/2"	5"	4-1/2"
1-1/2"	5-1/2"	4-1/4"	

( ) Connect a 3" wire from lug 2 of terminal strip K (NS) to lug 5 of tube socket V1 (NS).

( ) Connect a 2-3/4" wire from lug 5 of tube socket V1 (NS) to lug 5 of tube socket V2 (NS).

( ) Connect a 1-1/2" wire from lug 2 of tube socket V2 (S-1) to lug 3 of crystal socket C (NS). Position this wire as shown.

NOTE: When wiring the octal plug, insert the bared wire end through the pin so the wire tip protrudes 1/8" beyond the end of the pin. Solder the wire by heating the tip of the pin only long enough for the solder to be drawn into the pin. Then cut off the excess wire from the tip of the pin.

( ) Connect an 8-1/2" wire from lug 1 of octal socket A (S-1) to pin 1 of octal plug S (S-1).

( ) Connect a 7-1/2" wire from lug 3 of octal socket A (S-1) to pin 3 of octal plug S (S-1).

( ) Connect a 5-1/2" wire from lug 4 of octal socket A (S-1) to lug 4 of terminal strip K (NS).

( ) Connect a 4-1/2" wire from lug 6 of octal socket A (S-1) to lug 1 of terminal strip K (NS).

( ) Connect a 5" wire from lug 8 of octal socket A (S-1) to lug 2 of terminal strip K (NS).

( ) Connect a 4-1/4" wire from lug 4 of terminal strip K (NS) to pin 4 of octal plug S (S-1).

( ) Connect a 4-3/4" wire from lug 1 of terminal strip K (NS) to pin 6 of octal plug S (S-1).

( ) Connect a 4-1/2" wire from lug 2 of terminal strip K (NS) to pin 8 of octal plug S (S-1).

NOTE: Remove all the insulation from a 12" length of hookup wire. This bare wire will be used in the following steps.

( ) Connect a 1" bare wire between lugs 2 (S-1) and 7 (S-1) of octal socket A.

( ) Connect a 1" bare wire from the center of this bare wire (S-1) to lug 2 (solder lug) of crystal socket C (NS).

( ) Connect a 2-1/2" bare wire from pin 2 (S-1) to pin 7 (S-1) of octal plug S.

( ) Connect a 1" bare wire from the center of this bare wire (S-1) to lug 3 (solder lug) of trimmer capacitor P (NS).

( ) Connect a 1-1/2" bare wire from the center post of tube socket V2 (NS) to solder lug G (S-2). Do not cut off the excess lead coming from G.

( ) Connect a 47 $\mu\mu$f disc capacitor between lugs 1 (NS) and 2 (solder lug) (S-2) of crystal socket C.

( ) Connect a 470 KΩ (yellow-violet-yellow) resistor from lug 2 (NS) to lug 3 (NS) of tube socket V1. Be sure to position this resistor close to the tube socket as shown.

( ) Connect a .9 Ω precision resistor from lug 3 (S-2) to lug 6 (S-1) of tube socket V1. Position this resistor parallel to the chassis as shown.

( ) Connect a 75 $\mu\mu$f disc capacitor from lug 3 (solder lug) of trimmer capacitor P (NS) to lug 8 of tube socket V1 (NS).

( ) Connect a .001 μfd disc capacitor from lug 3 (NS) to lug 4 (NS) of terminal strip K.

( ) Connect a .001 μfd disc capacitor from lug 1 (NS) to lug 3 (NS) of terminal strip K.

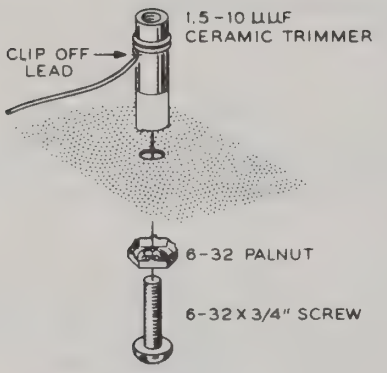
( ) Insert one lead of a 1 $\mu\mu$f (brown-black-white) tubular capacitor through lug 9 of tube socket V2 (S-2). Do not cut off the excess lead as it will be connected later. Connect the other lead of this capacitor to lug 6 of tube socket V2 (NS).

( ) Insert one lead of a 10 $\mu\mu$f disc capacitor through lug 1 of tube socket V2 (S-2). Do not cut off the excess lead as it will be connected later. Connect the other lead of this capacitor to the center post of tube socket V2 (NS).

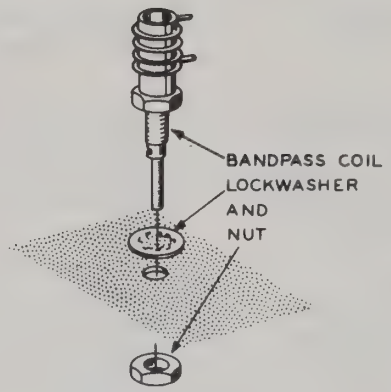
( ) Connect a 10 KΩ (brown-black-orange) resistor from lug 3 of crystal socket C (S-2) to the center post of tube socket V2 (NS).

( ) Connect a 470 $\mu\mu$f disc capacitor from lug 2 (S-2) to the center post (NS) of tube socket V1.

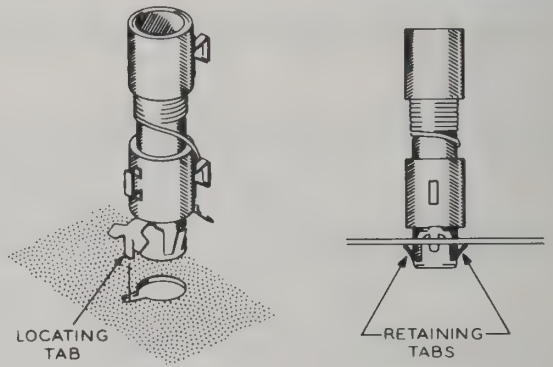
( ) Connect a 470 $\mu\mu$f disc capacitor from lug 5 (S-3) to the center post (S-2) of tube socket V1. Be sure the two lugs and the #6 solder lug bent against the center post are also soldered.



Detail 3A



Detail 3B



Detail 3C

Refer to Pictorial 3 (fold-out from Page 21) for the following steps.

( ) Connect a 470 μμf disc capacitor from lug 5 (S-2) to the center post (NS) of tube socket V2.

( ) Referring to Detail 3A, locate the 1.5-10 μμf ceramic trimmer, 6-32 palnut, and a 6-32 x 3/4" screw. Start the palnut onto the screw.

( ) Clip off the lead on the trimmer as shown in Detail 3A.

( ) Mount the trimmer at N by inserting the screw with the palnut from the top of the chassis into the trimmer. Turn the screw about halfway into the trimmer and then tighten the palnut. Be sure the ridges of the trimmer are seated in the oblong hole before tightening the palnut.

( ) Referring to Detail 3B, mount the two bandpass coils (#40-203) at H and J, using the lockwasher and nut supplied with the coils. Be sure to position the terminals of the coils as shown in the Pictorial.

( ) Referring to Detail 3C, install the multiplier coil (#40-612) at D. Position the coil in the hole, with the locating tab in the slot. Now push the coil back and forth until the retaining tabs snap into place.

( ) Similarly, install the oscillator coil (#40-622) at E.

( ) Insert one lead of a 3.3 $\mu\mu$f disc capacitor through lug 1 of coil D (S-2) to lug 6 of tube socket V2 (S-2). Connect the other lead of this capacitor to lug 2 of coil D (NS).

( ) Connect the lead coming from lug 9 of tube socket V2 to lug 1 of coil H (S-1).

( ) Connect a 470 $\mu\mu$f disc capacitor from lug 2 of coil D (NS) to the center post of tube socket V2 (S-5).

( ) Insert one lead of a 10 $\mu\mu$f disc capacitor through lug 1 of coil E (S-2) to lug 3 of tube socket V2 (S-1). Connect the other lead of this capacitor to lug 2 of coil E (NS).

( ) Connect a 470 $\mu\mu$f disc capacitor from lug 1 of crystal socket C (S-2) to lug 2 of coil E (NS).

( ) Prepare a 2.2 megohm (red-red-green) resistor and a 47 $\mu\mu$f disc capacitor combination as shown in the inset drawing on Pictorial 3.

( ) Connect this resistor-capacitor combination from lug 2 of coil H (S-1) to ground lug M (S-1).

( ) Connect a .001 μfd disc capacitor between lugs 2 (S-4) and 3 (NS) of terminal strip K.

( ) Connect a 100 Ω (brown-black-brown) resistor from lug 8 of tube socket V1 (S-2) to lug 3 of terminal strip K (S-4).

( ) Connect a 100 KΩ (brown-black-yellow) resistor from lug 7 of tube socket V1 (NS) to lug 4 of terminal strip K (S-4).

( ) Connect a 75 $\mu\mu$f disc capacitor from lug 7 of tube socket V1 (S-2) to ceramic trimmer N (NS). Wrap this lead around the body of the trimmer.

( ) Connect a 1" bare wire from lug 1 of trimmer capacitor P (NS) to lug 1 of phono socket R (S-1).

( ) Connect image trap coil (#40-209) between lugs 1 (S-2) and 2 (NS) of trimmer capacitor P. Position the coil as shown in the Pictorial.

Locate the RF coil (#40-326) and position it so the three leads come out as shown in the Pictorial. Connect the three leads as follows:

( ) Connect lead 1 to ceramic trimmer N (S-2).

( ) Connect lead 2 to lug 2 of trimmer capacitor P (S-2).

( ) Place lead 3 against lug 3 (solder lug) of trimmer capacitor P (S-3).

Refer to Pictorial 4 for the following steps.

( ) Connect one lead of a 3.3 $\mu\mu$f disc capacitor around lug 1 of coil J (S-2) to lug 1 of terminal strip K (NS).

( ) Connect the other lead of this capacitor around lug 2 of coil J (S-2) to lug 1 of tube socket V1 (S-1).

( ) Install the output coil (#40-623) at F. Position the coil in the hole, with the locating tab in the slot. Now push the coil back and forth until the retaining tabs snap into place.

( ) Connect the free end of the 10 $\mu\mu$f capacitor lead coming from lug 1 of tube socket V2 to lug 4 of coil F (S-1).

( ) Connect the free end of the bare wire coming from solder lug G to lug 3 of coil F (NS).

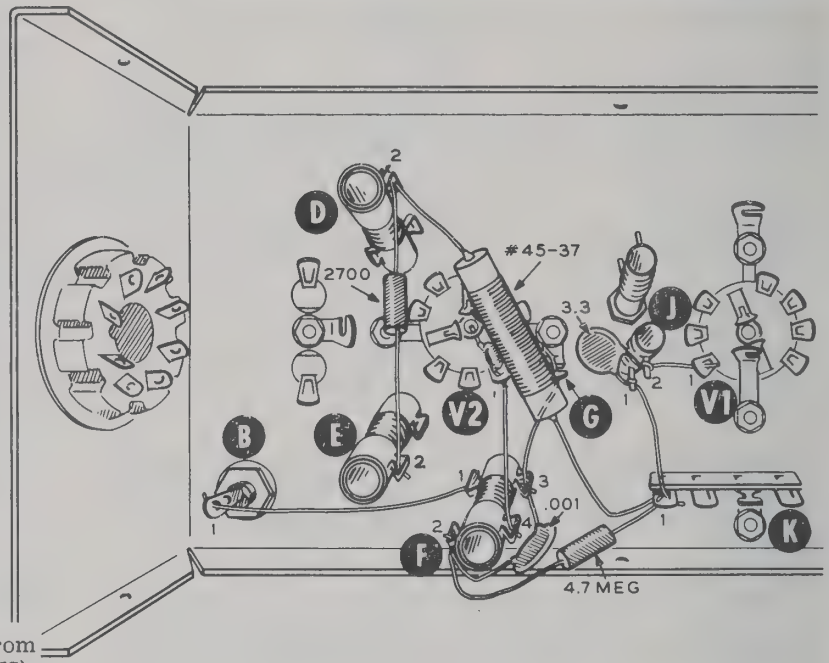
( ) Connect a .001 μfd disc capacitor between lugs 2 (NS) and 3 (S-2) of coil F.

( ) Connect a 1-1/2" bare wire from lug 1 of coil F (S-1) to lug 1 of phono socket B (S-1).

( ) Connect a 4.7 megohm (yellow-violet-green) resistor from lug 2 of coil F (S-2) to lug 1 of terminal strip K (NS).

( ) Connect a 2700 Ω (red-violet-red) resistor from lug 2 of coil D (NS) to lug 2 of coil E (S-3).

( ) Connect a choke (#45-37) from lug 2 of coil D (S-4) to lug 1 of terminal strip K (S-6). Position the choke as shown.



PICTORIAL 4

( ) Install the 38.66666 megacycle crystal in the crystal socket.

( ) Install the two tubes in their respective tube sockets.

NOTE: The blue and white identification label shows the Model Number and Production Series Number of your kit. Refer to these numbers in any communications with the Heath Company; this assures you that you will receive the most complete and up-to-date information in return.

( ) Install the identification label in the following manner:

1. Select a location for the label where it can easily be seen when needed, but will not show when the unit is in operation. This location might be on the rear panel or the top of the chassis, or on the rear or bottom of the cabinet.

2. Carefully peel away the backing paper. Then press the label into position.

CABLE PREPARATION

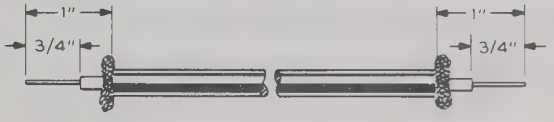
Refer to Pictorial 5 for the following steps.

( ) Locate the length of shielded cable and prepare each end as shown in the Pictorial.

( ) Install a phono plug on each prepared end of the cable as shown in the Pictorial.

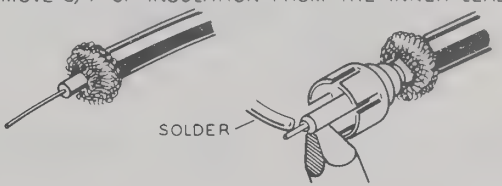
( ) Lay this shielded cable aside to be used later.

NOTE: An extra phono plug is provided for use in connecting your antenna cable to the Converter.

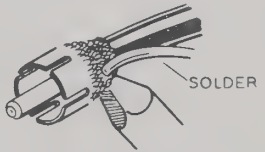


TAKING CARE NOT TO CUT THE OUTER SHIELD OF VERY THIN WIRES, REMOVE THE OUTER INSULATION.

PUSH THE SHIELD BACK AS FAR AS IT WILL GO AND REMOVE 3/4" OF INSULATION FROM THE INNER LEAD.



PLACE THE PHONO PLUG ON THE CABLE FIRMLY AGAINST THE INNER INSULATION SOLDER THE INNER LEAD.



PUSH THE SHIELD UP ON THE BASE OF THE PHONO PLUG AND SOLDER, THEN TRIM THE INNER LEAD FROM THE TIP.

PICTORIAL 5

Refer to Pictorial 6 for the following steps.

( ) Locate the length of 8-wire cable and prepare each end as shown in the Pictorial.

( ) Remove 1/4" of insulation from the end of each inner wire and apply a small amount of solder to the bared ends. This will hold the small wire strands together.

( ) Place an octal cap over each cable end, then connect the wires at each end of the cable to the octal socket and plug as shown.

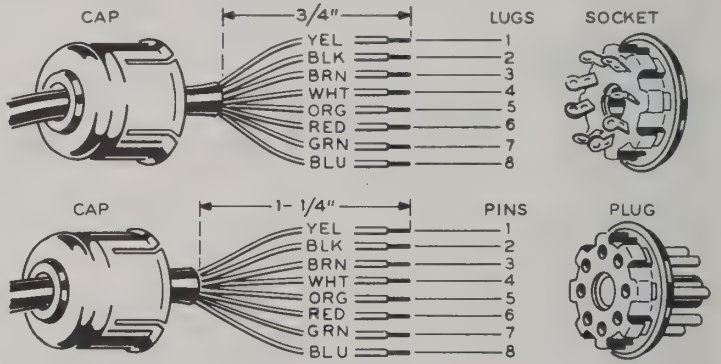
( ) Check all the connections at each end of the cable. Be sure none of them are shorted out due to solder splashes.

( ) Snap the caps onto the octal plug and socket.

( ) Set this cable aside to be used later.

TAKING CARE NOT TO CUT THE INNER LEADS REMOVE THE OUTER INSULATION OF THE CABLE.

REMOVE 1/4" OF INSULATION FROM THE END OF EACH INNER LEAD. APPLY A SMALL AMOUNT OF SOLDER TO THE BARED WIRE ENDS. THEN CONNECT THE LONGER LEADS TO THE OCTAL PLUG AND THE SHORTER LEADS TO THE OCTAL SOCKET AS FOLLOWS.



PICTORIAL 6

INITIAL TEST AND ADJUSTMENT

NOTE: This Converter was designed for use with the Heathkit SB-300 Receiver, but it can also be used with other receivers that tune the 10-meter band, and provide suitable filament, B+, and AGC voltages. These voltages should be connected to the octal plug of the power cable as follows:

Pin 8 Filament, 6.3 volts at 815 milliamperes.
Pin 2 Ground.
Pin 6 B+, 130 volts at 12.5 milliamperes.
Pin 4 AGC 0.7 to 9.0 volts (-DC).
Pin 7 Ground.

The following adjustments are made with the Converter connected to a Heathkit SB-300 Receiver that is operating, and properly aligned. An 11 megohm input VTVM will be needed for some of these adjustments.

( ) Set the SB-300 Receiver front panel controls as follows:

AGC - OFF.
MODE - AM.
FUNCTION - STBY.
BAND - 28.5.
AF GAIN - Fully counterclockwise.
RF GAIN - Fully clockwise.
SLIDE RULE DIAL - On 1.
CIRCULAR DIAL - On 0.

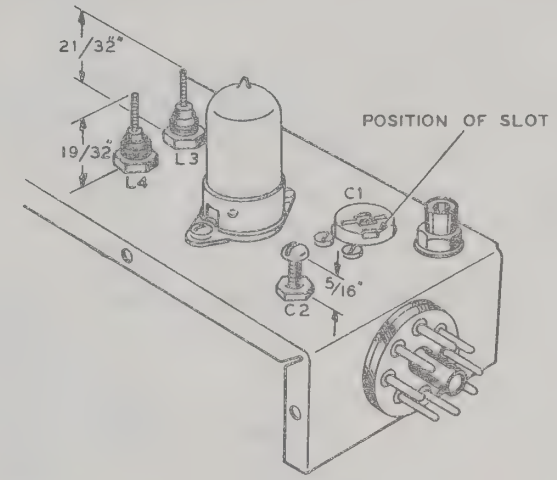
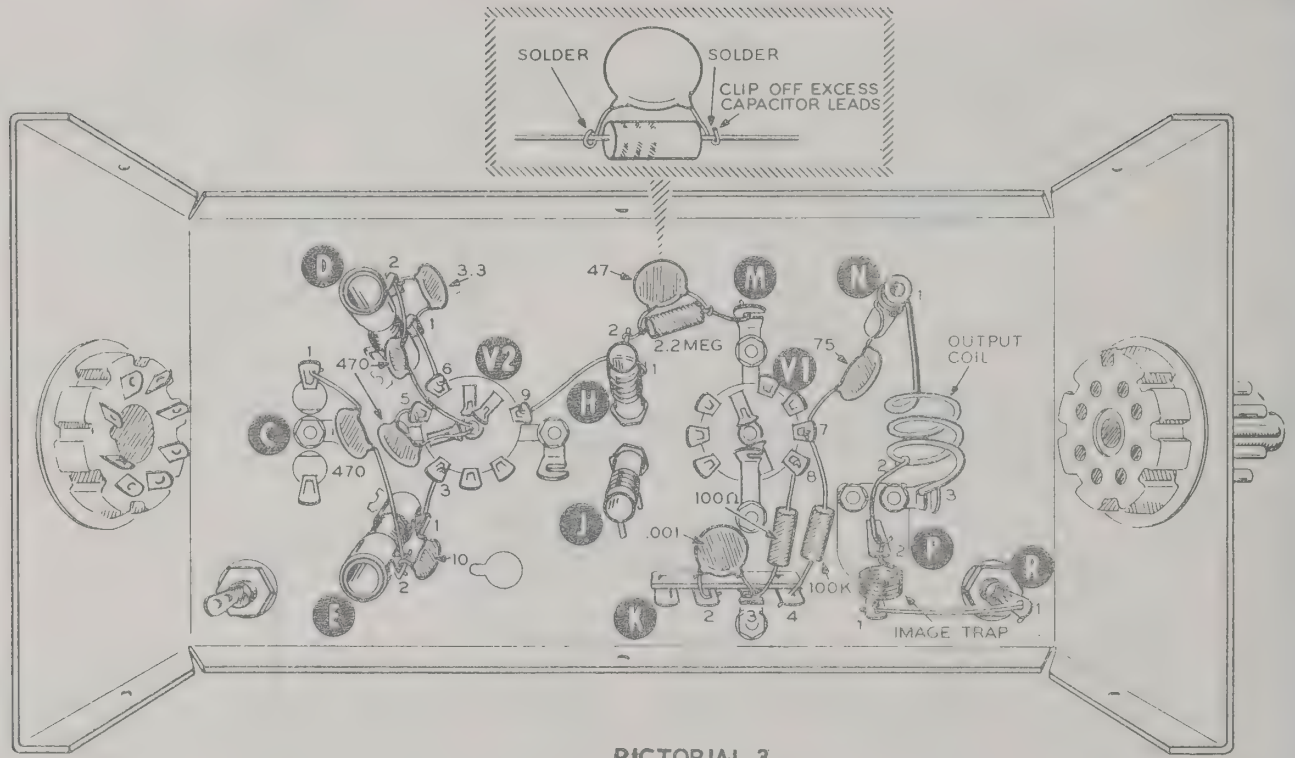


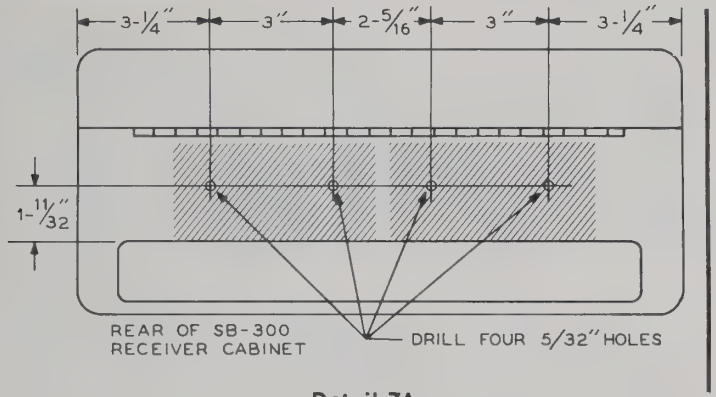
Figure 1

( ) Referring to Figure 1, preset coils L3 and L4, and capacitors C1 and C2 as shown.

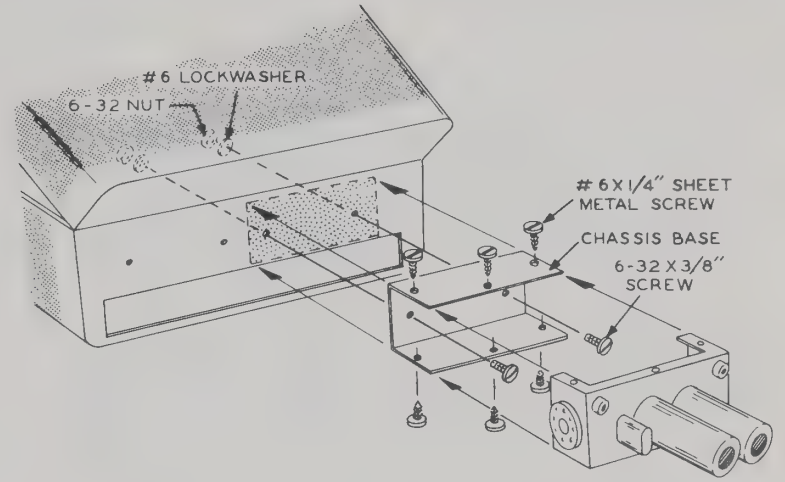
( ) Connect the power cable prepared previously, from the Receiver socket to the Converter plug.


SOLDER
SOLDER
CLIP OFF EXCESS CAPACITOR LEADS
D
3.3
47
M
N
2.2MEG
V2
V1
OUTPUT COIL
75
470
H
C
470
100Ω
J
.001
100K
P
R
E
K
IMAGE TRAP

PICTORIAL 3



Detail 7A



PICTORIAL 7

PERMANENT MOUNTING

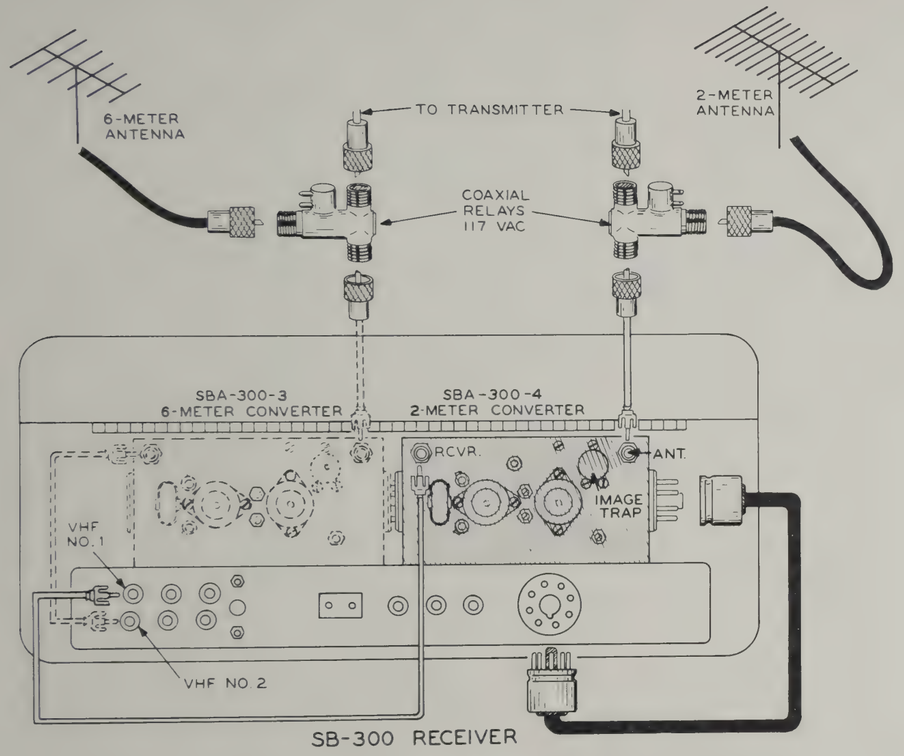
NOTE: Some early model SB-300 Receiver Cabinets do not have holes in the back of the cabinet for the Converter installation. If your cabinet does not have these holes, use Detail 7A to locate and drill the holes needed for Converter mounting. Be sure to remove the receiver from the cabinet before drilling the holes.

Refer to Pictorial 7 for the following steps.

( ) Install the chassis base to the rear of the receiver cabinet. Use two 6-32 x 3/8" screws, #6 lockwashers, and 6-32 nuts.

( ) Install the chassis to the chassis base, using six #6 x 1/4" sheet metal screws. Make sure the hookup wires are pushed away from the screw holes in the chassis before tightening the screws.

( ) Install the Receiver chassis into the cabinet.



PICTORIAL 9

( ) Set the Receiver Converter switch to VHF No. 1. With the Converter switch in this position, filament and B+ voltages are applied to the Converter. The filaments of the Converter tubes should light.

( ) If there is any sign of overheating components, turn the Receiver Converter switch to the HF position to remove filament and B+ voltages from the Converter. If no difficulty is encountered, proceed with the following steps.

( ) Install the tube shields over the Converter tubes.

( ) Set the Receiver Function switch to OPR (operate).

( ) Set the VTVM to read -DC volts on the 15 volt or higher range.

( ) Connect the DC probe of the VTVM to lug 2 of coil L4 (coil H) and connect the common VTVM lead to the Converter chassis. Refer to Pictorial 3 for the coil lug location.

( ) Using the alignment tool supplied, adjust oscillator coils L6 and L7 for a maximum VTVM reading.

( ) Disconnect the VTVM test leads from the Converter.

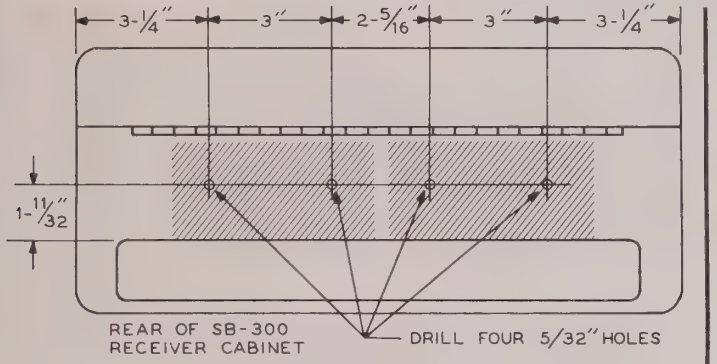
( ) Set the Receiver Function switch to OFF.

( ) Disconnect the Converter power cable from the Receiver socket.

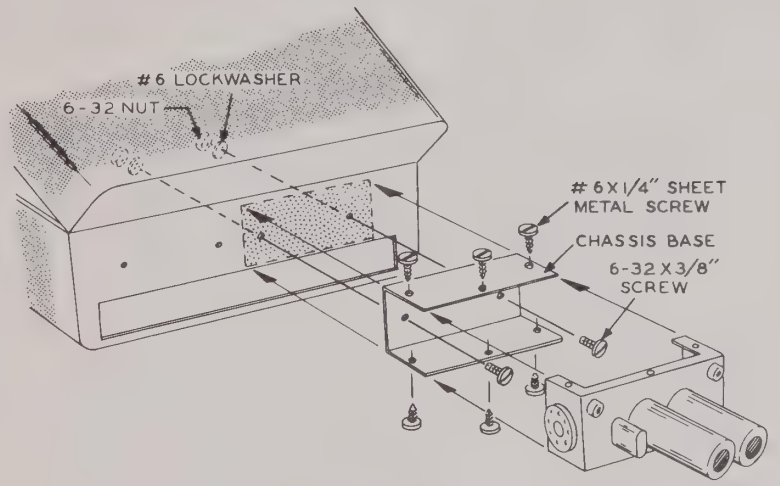
This completes the Initial Test and Adjustment of the Converter. Proceed with the Installation section.

INSTALLATION

NOTE: Permanent and Alternate Mounting instructions are given. Use the permanent mounting section if you prefer to have the Converter attached to the rear of your SB-300 Receiver; if you do not want the Converter attached to the Receiver, use the Alternate Mounting section.



Detail 7A



PICTORIAL 7

PERMANENT MOUNTING

NOTE: Some early model SB-300 Receiver Cabinets do not have holes in the back of the cabinet for the Converter installation. If your cabinet does not have these holes, use Detail 7A to locate and drill the holes needed for Converter mounting. Be sure to remove the receiver from the cabinet before drilling the holes.

Refer to Pictorial 7 for the following steps.

( ) Install the chassis base to the rear of the receiver cabinet. Use two 6-32 x 3/8" screws, #6 lockwashers, and 6-32 nuts.

( ) Install the chassis to the chassis base, using six #6 x 1/4" sheet metal screws. Make sure the hookup wires are pushed away from the screw holes in the chassis before tightening the screws.

( ) Install the Receiver chassis into the cabinet.

ALTERNATE MOUNTING

Refer to Pictorial 8 for the following steps.

( ) Install the four rubber feet to the bottom of the chassis base.

( ) Install the chassis to the chassis base, using six #6 x 1/4" sheet metal screws. Make sure the hookup wires are pushed away from the screw holes in the chassis before tightening the screws.

CABLE HOOKUP

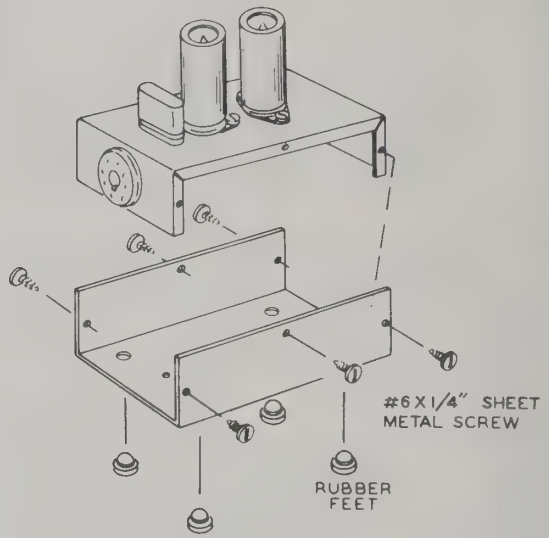
Refer to Pictorial 9 (fold-out from Page 22) for the following steps.

( ) Connect the power cable from the Converter to the Receiver socket.

( ) Connect the prepared shielded cable from the RCVR socket of the Converter to the VHF No. 1 socket of the SB-300 Receiver.

( ) Connect your 2-meter antenna to the ANT socket of the Converter.

Pictorial 9 shows all the cable connections for using the SBA-300-4, 2-Meter Converter with the SB-300 Receiver. Connections for the SBA-300-3, 6-Meter Converter (available as a separate kit) are shown by dotted lines.



PICTORIAL 8

OPERATION

IMAGE TRAP ADJUSTMENT

( ) Tune the receiver across the 2-meter band. If an IF image appears at the high or low end of the band (this would be an FM broadcast station near your locality), turn image trap adjustment C1 for minimum signal leak-through. If more than one image appears, adjust the image trap for minimum signal on the stronger image, or adjust the image trap between the two stronger signals.

ANTENNA TRIMMER ADJUSTMENT

( ) Adjust trimmer capacitor C2 for the best signal-to-noise ratio when tuned to a weak 2-meter signal.

Instrument alignment should not be required, as the previous adjustments of the coils and capacitors should provide Converter operation equal to or better than the specifications. In case you have the necessary equipment, and prefer instrument alignment, refer to Page 26 and 27 of this Manual.

CRYSTAL INFORMATION

The 38.66666 megacycle crystal supplied with the Converter provides reception from 144 to 146 megacycles. Other crystal frequencies can be used to cover different 2-megacycle segments between 142 and 150 megacycles. The following chart lists some of the crystal frequencies that can be used. In each case, the output frequency of the Converter is between 28 and 30 mc, which corresponds to 10-meter reception with the SB-300 Receiver.

CRYSTAL CHART

(Frequencies in megacycles)

CONVERTER CRYSTAL	COVERAGE
38	142 to 144
38.66666	144 to 146
39.33333	146 to 148
40	148 to 150

When purchasing a crystal for use with this Converter, you should specify the frequency and the following crystal characteristics. Crystals that do not have these characteristics will not provide optimum performance.

Load capacitance (C1):	19.1 $\mu\mu$f
Internal capacity (Co):	7 $\mu\mu$f, maximum
Series resistance (Rs):	30 Ω, maximum
Drive level:	10 millivolts
Mode of operation:	3rd overtone

Also, if you install a crystal other than the 38.66666 megacycle crystal supplied, it will be necessary to readjust oscillator coils L6 and L7 as directed in the Initial Test And Adjustment section of the manual.

INSTRUMENT ALIGNMENT

Instrument alignment of the Converter is not required for normal operation; however, if you have access to the necessary test equipment, complete instrument alignment will assure optimum performance. A signal generator that covers 142 to 150 megacycles and a vacuum tube voltmeter will be needed.

( ) Connect the vacuum tube voltmeter to the speaker terminals of the Receiver. Set the vacuum tube voltmeter to the 1.5 volt AC range.

( ) Set the SB-300 Receiver controls as follows:

AGC - OFF.
MODE - AM.
FUNCTION - OPR.
RF GAIN - Fully clockwise.
Slide rule dial - 1.
Circular dial - 0.
Converter switch - VHF No. 1.

( ) Unplug the antenna and connect the signal generator output to the Converter ANT socket.

( ) Set the signal generator for 30% modulation, and keep the signal output level at 3 microvolts during alignment.

Now align the Converter as directed in the Instrument Alignment Chart.

NOTE: The signal generator frequencies given in the Instrument Alignment Chart are for use with a 38.66666 megacycle crystal in the Converter. If you have a different frequency crystal in the Converter, it will be necessary to change the signal generator frequencies accordingly.

For example: Step 1 in the Instrument Alignment Chart calls for a signal generator frequency of 145.0 megacycles. If you are using a 40 megacycle crystal, you should set the signal generator to 147.0 megacycles (+2 megacycles).

INSTRUMENT ALIGNMENT CHART

	SB-300 BAND	SB-300 AF GAIN	SB-300 PRE-SELECTOR	SIGNAL GENERATOR (400 cps with 30% modulation)	SB-300 CIRCULAR DIAL	CONVERTER ADJUSTMENTS					
						L5	L6	L7	L3 and L4	C1	C2
1	29.0 MC	3/4 OF ROTATION	MAXIMUM VTVM READING (NOISE)	145.0 MC	MAXIMUM VTVM READING	MAXIMUM VTVM READING	ADJUST L6 AND SB-300 CIRCULAR DIAL FOR MAXIMUM VTVM READING	MAXIMUM VTVM READING			
2	28.0 MC	3/4 OF ROTATION	MAXIMUM VTVM READING (NOISE)	144.0 MC	MAXIMUM VTVM READING				ADJUST L3 FOR MAXIMUM VTVM READING		
3	30.0 MC	3/4 OF ROTATION	MAXIMUM VTVM READING (NOISE)	146.0 MC	MAXIMUM VTVM READING				ADJUST L4 FOR MAXIMUM VTVM READING		
4	28.25 MC	ADJUST FOR SOME REFERENCE LEVEL ON VTVM	MAXIMUM VTVM READING (NOISE)	144.25 MC	MAXIMUM VTVM READING				ADJUST L3 FOR MAXIMUM VTVM READING	REPEAT THESE TWO STEPS FOR MAXIMUM VTVM READINGS. READINGS SHOULD NOT VARY MORE THAN 3 TO 4 DB BETWEEN THESE TWO FREQUENCY SETTINGS.	
5	29.75 MC	DO NOT CHANGE OBSERVE READING ON VTVM	MAXIMUM VTVM READING (NOISE)	145.75 MC	MAXIMUM VTVM READING				ADJUST L4 FOR MAXIMUM VTVM READING		
6	29.0 MC	3/4 OF ROTATION	MAXIMUM VTVM READING (NOISE)	87 MC (GENERATOR AT MAXIMUM OUTPUT)	MAXIMUM VTVM READING					MINIMUM VTVM READING	
7	28.0 MC	3/4 OF ROTATION	MAXIMUM VTVM READING (NOISE)	DISCONNECT SIGNAL GENERATOR AND CONNECT ANTENNA	TUNE FOR ON-THE-AIR SIGNAL						ADJUST FOR BEST SIGNAL TO NOISE RATIO

IN CASE OF DIFFICULTY

NOTE: Refer to the Kit Builders Guide for Warranty information.

1. Recheck the wiring. Trace each lead in colored pencil on the Pictorial as it is checked. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something consistently overlooked by the constructor.

2. It is interesting to note that about 90% of the kits that are returned for repair, do not function properly due to poor connections and soldering. Therefore, many troubles can be eliminated by reheating all connections to make sure that they are soldered as described in the Proper Soldering Techniques section of this manual.

3. Check the values of the parts. Be sure that the proper part has been wired into the circuit, as shown in the pictorial diagrams and as called out in the wiring instructions.

4. Check for bits of solder, wire ends or other foreign matter which may be lodged in the wiring.

5. If, after careful checks, the trouble is still not located and a voltmeter is available, check voltage readings against those shown on the Schematic Diagram. NOTE: All voltage readings were taken with an 11 megohm input vacuum tube voltmeter. Voltages may vary as much as 10%.

6. A review of the Circuit Description will prove helpful in indicating where to look for trouble.

SERVICE INFORMATION

SERVICE

If, after applying the information in this manual and your best efforts, you are still unable to obtain proper performance, it is suggested that you take advantage of the technical facilities which the Heath Company makes available to its customers.

The Technical Consultation Department is maintained for your benefit. This service is available to you at no charge. Its primary purpose is to provide assistance for those who encounter difficulty in the construction, operation or maintenance of HEATHKIT equipment. It is not intended, and is not equipped to function as a general source of technical information involving kit modifications nor anything other than the normal and specified performance of HEATHKIT equipment.

Although the Technical Consultants are familiar with all details of this kit, the effectiveness of their advice will depend entirely upon the amount and the accuracy of the information furnished by you. In a sense, YOU MUST QUALIFY for GOOD technical advice by helping the consultants to help you. Please use this outline:

1. Before writing, fully investigate each of the hints and suggestions listed in this manual under In Case Of Difficulty. Possibly it will not be necessary to write.
2. When writing, clearly describe the nature of the trouble and mention all associated equipment. Specifically report operating procedures, switch positions, connections to other units, and anything else that might help to isolate the cause of trouble.
3. Report fully on the results obtained when testing the unit initially and when following the suggestions under In Case Of Difficulty. Be as specific as possible and include voltage readings if test equipment is available.
4. Identify the kit Model Number and Series Number, and date of purchase, if available. Also mention the date of the kit assembly manual. (Date at bottom of Page 1.)
5. Print or type your name and address, preferably in two places on the letter.

With the preceding information, the consultant will know exactly what kit you have, what you would like it to do for you and the difficulty you wish to correct. The date of purchase tells him whether or not engineering changes have been made since it was shipped to you. He will know what you have done in an effort to locate the cause of trouble and, thereby, avoid repetitious suggestions. In short, he will devote full time to the problem at hand, and through his familiarity with the kit, plus your accurate report, he will be able to give you a complete and helpful answer. If replacement parts are required, they will be shipped to you, subject to the terms of the Warranty.

The Factory Service facilities are also available to you, in case you are not familiar enough with electronics to provide our consultants with sufficient information on which to base a diagnosis of your difficulty, or in the event that you prefer to have the difficulty corrected in this manner. You may return the completed equipment to the Heath Company for inspection and necessary repairs and adjustments. You will be charged a minimal service fee, plus the price of any additional parts or material required. However, if the completed kit is returned within the Warranty period, parts charges will be governed by the terms of the Warranty. State the date of purchase, if possible.

Local Service by Authorized HEATHKIT Service Centers is also available in some areas and often will be your fastest, most efficient method of obtaining service. HEATHKIT Service Centers will honor the regular 90 day HEATHKIT Parts Warranty on all kits, whether purchased through a dealer or directly from the Heath Company; however, it will be necessary that you verify the purchase date of your kit.

Under the conditions specified in the Warranty, replacement parts are supplied without charge; however, if the Service Center assists you in locating a defective part (or parts) in your kit, or installs a replacement part for you, you may be charged for this service.

HEATHKIT equipment purchased locally and returned to Heath Company for service must be accompanied by your copy of the dated sales receipt from your authorized HEATHKIT dealer in order to be eligible for parts replacement under the terms of the Warranty.

THIS SERVICE POLICY APPLIES ONLY TO COMPLETED EQUIPMENT CONSTRUCTED IN ACCORDANCE WITH THE INSTRUCTIONS AS STATED IN THE MANUAL. Equipment that has been modified in design will not be accepted for repair. If there is evidence of acid core solder or paste fluxes, the equipment will be returned NOT repaired.

For information regarding modification of HEATHKIT equipment for special applications, it is suggested that you refer to any one or more of the many publications that are available on all phases of electronics. They can be obtained at or through your local library, as well as at most electronic equipment stores. Although the Heath Company sincerely welcomes all comments and suggestions, it would be impossible to design, test, evaluate and assume responsibility for proposed circuit changes for special purposes. Therefore, such modifications must be made at the discretion of the kit builder, using information available from sources other than the Heath Company.

REPLACEMENTS

Material supplied with HEATHKIT products has been carefully selected to meet design requirements and ordinarily will fulfill its function without difficulty. Occasionally, improper operation can be traced to a faulty component. Should inspection reveal the necessity for replacement, write to the Heath Company and supply all of the following information.

A. Thoroughly identify the part in question by using the part number and description found in the manual Parts List.

B. Identify the kit Model Number and Series Number.

C. Mention date of purchase.

D. Describe the nature of defect or reason for requesting replacement.

The Heath Company will promptly supply the necessary replacement. PLEASE DO NOT RETURN THE ORIGINAL COMPONENT UNTIL SPECIFICALLY REQUESTED TO DO SO. Do not dismantle the component in question as this will void the guarantee. This replacement policy does not cover the free replacement of parts that may have been broken or damaged through carelessness on the part of the kit builder.

SHIPPING INSTRUCTIONS

In the event that your instrument must be returned for service, these instructions should be carefully followed.

Wrap the equipment in heavy paper, exercising care to prevent damage. Place the wrapped equipment in a stout carton of such size that at least three inches of shredded paper, excelsior, or other resilient packing material can be placed between all sides of the wrapped equipment and the carton. Close and seal the carton with gummed paper tape, or alternately, tie securely with stout cord. Clearly print the address on the carton as follows:

To: HEATH COMPANY
Benton Harbor, Michigan 49022

ATTACH A LETTER TO THE OUTSIDE OF THE CARTON BEARING YOUR NAME, COMPLETE ADDRESS, DATE OF PURCHASE, AND A BRIEF DESCRIPTION OF THE DIFFICULTY ENCOUNTERED. Also, include your name and return address on the outside of the carton. Preferably affix one or more "Fragile" or "Handle With Care" labels to the carton, or otherwise so mark with a crayon of bright color. Ship by insured parcel post or prepaid express; note that a carrier cannot be held responsible for damage in transit if, in HIS OPINION, the article is inadequately packed for shipment.

REPLACEMENT PARTS PRICE LIST

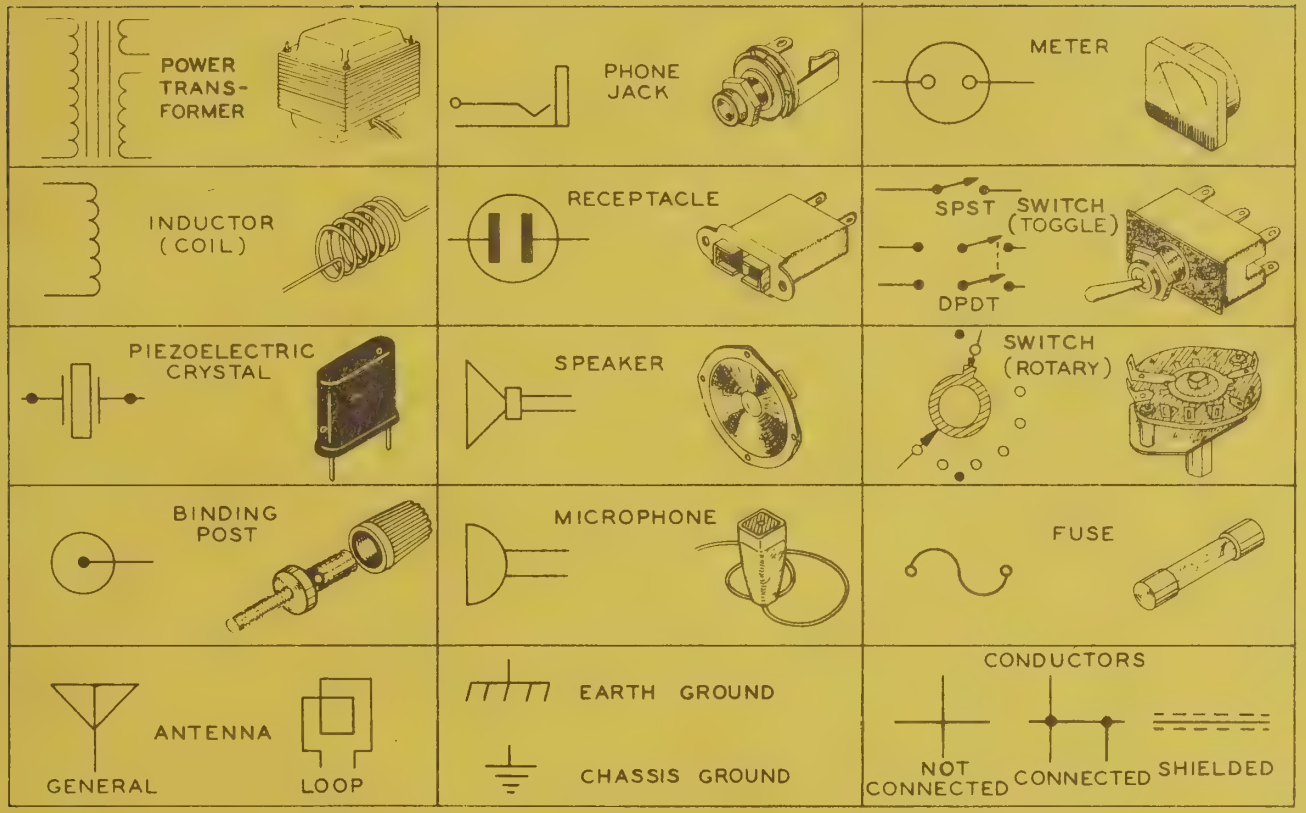
PART No.	PRICE Each	DESCRIPTION
RESISTORS-1/2 WATT		
2-149	.75	.900 Ω
1-3	.10	100 Ω
1-13	.10	2700 Ω
1-20	.10	10 KΩ
1-26	.10	100 KΩ
1-33	.10	470 KΩ
1-37	.10	2.2 megohm
1-39	.10	4.7 megohm
CAPACITORS		
21-33	.10	3.3 μμf disc
21-3	.10	10 μμf disc
21-32	.10	47 μμf disc
21-54	.10	75 μμf disc
21-56	.10	470 μμf disc
21-14	.10	.001 μfd disc
28-2	.10	1.0 μμf tubular
31-17	.90	5-25 μμf trimmer
31-21	.20	1.5 - 10 μμf trimmer
COILS		
40-203	1.85	Bandpass
40-209	.35	Image trap
40-326	.30	RF
40-612	.40	Multiplier
40-622	.50	Oscillator
40-623	.45	Output
45-37	.25	Choke

PART No.	PRICE Each	DESCRIPTION
HARDWARE		
Screws		
250-170	.05	#6 x 1/4" sheet metal
250-49	.05	3-48 x 1/4"
250-133	.05	3-48 x 7/16"
250-89	.05	6-32 x 3/8"
250-134	.05	6-32 x 3/4"
Nuts		
252-1	.05	3-48
252-3	.05	6-32
252-19	.05	6-32 palnut
Lockwashers		
254-7	.05	#3
254-1	.05	#6
254-14	.05	1/4"
Miscellaneous		
259-6	.05	#6 solder lug
260-29	.25	Crystal clip
435-1	.10	Mounting ring
WIRE-CABLES		
344-59	.05/ft	Hookup wire
347-1	.10/ft	8-wire cable
343-2	.10/ft	Shielded cable
CRYSTAL-TUBES		
404-250	4.05	38.66666 mc crystal
411-124	1.50	6EA8 tube
411-208	2.15	6DJ8 tube

PART No.	PRICE Each	DESCRIPTION
TERMINAL STRIP-SOCKETS-PLUGS		
431-49	.15	11-lug terminal strip
434-4	.30	Octal socket
434-36	.30	9-pin tube socket
434-74	.15	Crystal socket
434-107	.25	Phono socket
438-4	.10	Phono plug
438-6	.35	Octal plug
MISCELLANEOUS		
206-3	.20	Tube shield
261-4	.05	Rubber feet
200-420-2	1.00	Chassis
201-32	.65	Chassis base
440-1	.20	Octal plug cap
490-1	.10	Alignment tool
331-6	.10	Solder
595-712	2.00	Manual

The above prices apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Selling prices elsewhere in U.S.A. may be slightly higher to offset transportation and local taxes. Outside the U.S.A. parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties and rates of exchange.

TYPICAL COMPONENT TYPES



HEATH COMPANY

THE WORLD'S FINEST ELECTRONIC EQUIPMENT IN KIT FORM

595-712

LITHO IN U S A

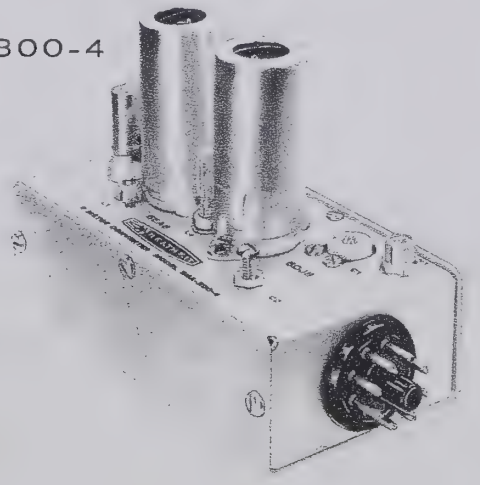
CONVERSION

Assembly and Operation of the

HEATHKIT

2-METER CONVERTER

MODEL SBA-300-4



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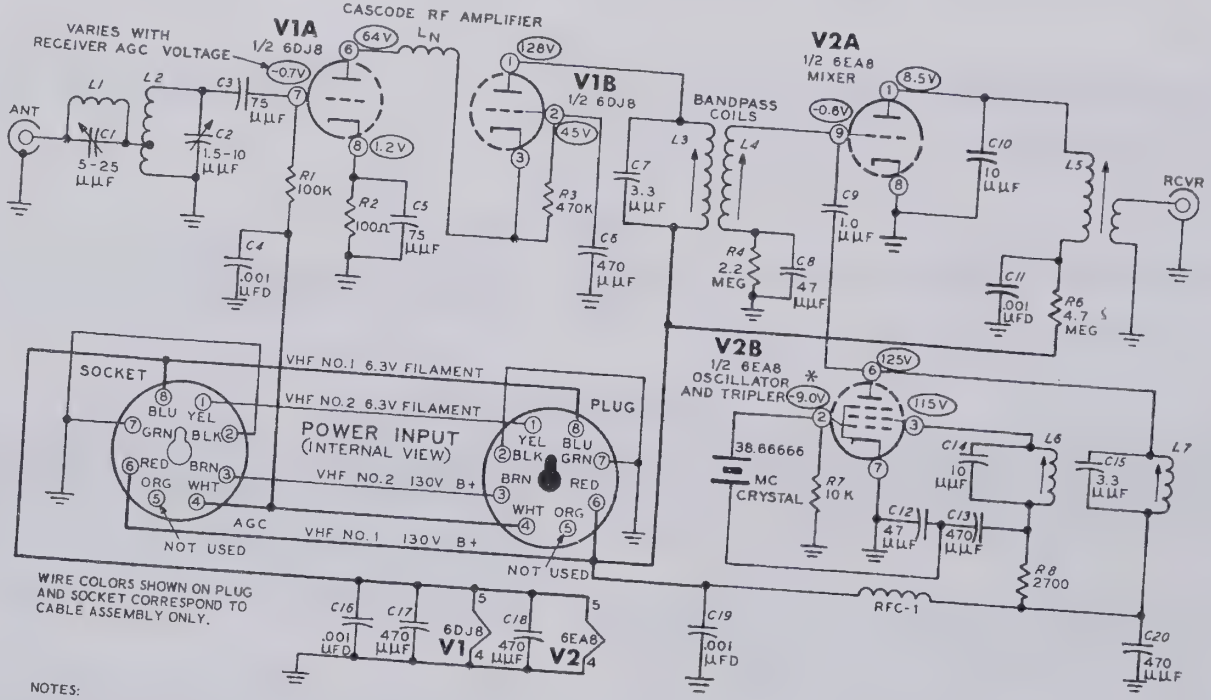
HEATH COMPANY

BENTON HARBOR, MICHIGAN

1-19-68

SPECIFICATIONS

Sensitivity. . . . . (Signal plus noise-to-noise in db)	AM: Less than 0.2 microvolt for 6 db at 3750 cps bandwid SSB: Less than 0.2 microvolt for 12 db at 2100 cps bandwid CW: Less than 0.2 microvolt for 20 db at 400 cps bandwid (Using Heathkit SB-300 Receiver.)
Noise Figure.	7 db or less.
Bandpass.	Essentially flat over any 2 megacycle segment from 142 150 megacycles.
Frequency.	Input: 142 to 150 megacycles (144 to 146 megacycles w crystal supplied). Output: 28 to 30 megacycles.
Image Rejection.	80 db or better at 88 megacycles.
IF Rejection.	50 db or better at 29 megacycles.
Crystal.	38.66666 megacycles ±.003%, 3rd overtone.
Tube Complement.	6DJ8 cascode RF amplifier. 6EA8 oscillator-tripler-mixer.
Power Requirements.	130 volts DC at 12.5 milliamperes. 6.3 volts AC at 815 milliamperes.



NOTES:

ALL RESISTORS ARE 1/2 WATT.
ALL RESISTOR VALUES ARE IN OHMS (K = 1000, MEG = 1,000,000).
( ) INDICATES VOLTAGE READING.
ALL VOLTAGES ARE DC POSITIVE UNLESS MARKED OTHERWISE.
ALL VOLTAGES ARE MEASURED FROM POINT INDICATED TO CHASSIS GROUND AND MAY VARY ±10%.
VOLTAGE READINGS TAKEN WITH AN 11 MEGOHM VTVM, WITH NO SIGNAL INPUT.
POWER INPUT LINES LABLED VHF NO. 2 RECEIVE POWER WHEN RECEIVER CONVERTER SWITCH IS IN VHF NO. 2 POSITION.
POWER INPUT LINES LABLED VHF NO. 1 RECEIVE POWER WHEN RECEIVER CONVERTER SWITCH IS IN VHF NO. 1 POSITION.
* VARIES WITH CRYSTAL ACTIVITY.

SCHEMATIC OF THE
HEATHKIT® 2-METER CONVERTER
MODEL SBA-300-4

Dimensions	Overall: 2-5/8" wide x 5-3/4" long x 3-3/4" high.
Net Weight	10-1/2 oz.
Test Equipment Used In Preparing Specifications Measurements, And Alignment Instructions	Measurements Corporation Model 80 Standard Signal Generator (with 50 Ω pad). Heathkit Model IM-13 Vacuum Tube Voltmeter.

The Heath Company reserves the right to discontinue instruments and to change specifications at any time without incurring any obligation to incorporate new features in instruments previously sold.

INTRODUCTION

The Heathkit Model SBA-300-4, 2-Meter Converter is designed to extend the frequency coverage of the Heathkit SB-300 Receiver to include 142 to 150 megacycles (144 to 146 megacycles with the 38.66666 megacycle crystal supplied). The Converter receives its filament, B+, and AGC voltages from the receiver through a power cable. The power cable connections for the Converter are switched by the Converter switch in the SB-300 Receiver.

A separate power socket on the Converter chassis provides power for the Heathkit Model SBA-300-3, 6-Meter Converter. Either one or both of these converters can be mounted on the rear of the SB-300 Receiver cabinet for a neat, easy installation.

The Converter circuit consists of a cascode RF amplifier, a crystal-controlled oscillator-tripler, and a mixer stage. The 2-stage RF amplifier provides low noise, plus excellent sensitivity characteristics; the crystal-controlled oscillator provides drift-free operation.

Although this Converter is designed for use with the Heathkit SB-300 Receiver, it can be used equally well with any other receiver that has similar characteristics and tunes from 28 to 30 megacycles.

The SBA-300-4 Converter and SB-300 Receiver combination provides high-sensitivity, high-stability, and low-noise VHF reception of AM, SSB, and CW signals in the 2-meter band.

CIRCUIT DESCRIPTION

Refer to the Schematic Diagram while reading the following Circuit Description.

CASCODE RF AMPLIFIER

Tube stages V1A and V1B are connected as an untuned cascode RF amplifier; V1A is a grounded-cathode stage, and V1B is a grounded-grid stage. The signal from the antenna is coupled across image trap coil L1, input coil L2, and through coupling capacitor C3 to the grid of tube V1A. Image trap coil L1 is adjusted to reject signals at 88 megacycles, while allowing the desired operating frequencies to pass. Input coil L2 is tapped to provide a 50 Ω antenna input impedance.

In tube V1A, the signal is amplified and then coupled to the cathode of tube V1B through L_N. Tube stage V1A is neutralized by L_N for optimum signal-to-noise ratio. After further amplification in V1B, the signal is coupled through bandpass coils L3 and L4. These coils are placed physically close together so they operate as a transformer; L3 serves as the primary and L4 as the secondary of the transformer. This circuit presents a high impedance to 143-149 megacycle signal frequencies, and is almost a short circuit to any other received signal frequencies that may be amplified by the cascode RF amplifier.

MIXER-OSCILLATOR-TRIPLER

The signal from coil L4 is directly coupled to the grid of tube V2A, which is used as a low-noise mixer. The oscillator signal from V2B is also applied to the grid of mixer V2A. The incoming signal frequency and the oscillator frequency are mixed V2A to produce an IF signal (28 to 30 megacycles). The pla circuit of V2A is tuned to the 29 megacycle IF midpoint by c pacitor C10 and coil L5. The IF signal is coupled from cc L5 to the receiver antenna input by a link winding on coil L This coil provides a 50 Ω output impedance to match the r ceiver antenna input impedance.

Tube V2B is a crystal-controlled oscillator stage. The gr and screen circuits of V2B form the oscillator. A 38.666(megacycle 3rd overtone crystal, coil L6, and capacitor C1 control the oscillator frequency. The plate circuit is tuned t the third harmonic of the crystal frequency by coil L7 an capacitor C15. This 115.999 megacycle signal is couple through capacitor C9 to the grid of mixer tube V2A. (Th 38.66666 megacycle crystal provides coverage between 14 and 146 megacycles. A 38, 39.333, or 40 megacycle crysta may also be used to cover 2 megacycle segments below an above the 144 to 146 megacycle range.)

POWER

Filament, B+, and AGC voltages are provided by the receiver through a cable assembly. The VHF No. 1 position of the SB-300 Receiver Converter switch applies power to the Converter through lugs 6 and 8 of the plug and socket. In the VHF No. 2 position, power is applied through lugs 1 and 3 of the octal plug and socket for use with a 6-Meter Converter. AGC voltage is applied through lug 4 and is not switched.

PARTS LIST

The numbers in parentheses in the Parts List are keyed to the numbers on the Parts Pictorial to aid in parts identification.

PART No.	PARTS Per Kit	DESCRIPTION
RESISTORS-1/2 WATT		
(1) 2-149	1	.900 Ω precision
(2) 1-3	1	100 Ω (brown-black-brown)
1-13	1	2700 Ω (red-violet-red)
1-20	1	10 KΩ (brown-black-orange)
1-26	1	100 KΩ (brown-black-yellow)
1-33	1	470 KΩ (yellow-violet-yellow)
1-37	1	2.2 megohm (red-red-green)
1-39	1	4.7 megohm (yellow-violet-green)
CAPACITORS		
(3) 21-33	2	3.3 μμf disc
21-3	2	10 μμf disc
21-32	2	47 μμf disc
21-54	2	75 μμf disc
21-56	5	470 μμf disc
21-14	4	.001 μfd disc
(4) 28-2	1	1.0 μμf tubular (brown-black-white)
(5) 31-17	1	5-25 μμf trimmer
(6) 31-21	1	1.5 - 10 μμf ceramic trimmer

PART No.	PARTS Per Kit	DESCRIPTION
COILS		
(7) 40-203	2	Bandpass (with lockwasher and nut)
(8) 40-209	1	Image trap
(9) 40-326	1	RF
(10) 40-612	1	Multiplier
40-622	1	Oscillator
40-623	1	Output
(11) 45-37	1	Choke
HARDWARE		
Screws		
(12) 250-170	6	#6 x 1/4" sheet metal
(13) 250-49	7	3-48 x 1/4"
(14) 250-133	1	3-48 x 7/16"
(15) 250-89	2	6-32 x 3/8"
(16) 250-134	1	6-32 x 3/4"
Nuts		
(17) 252-1	8	3-48
(18) 252-3	2	6-32
(19) 252-19	1	6-32 palnut

PART No.	PARTS Per Kit	DESCRIPTION
Lockwashers		
(20) 254-7	14	#3
(21) 254-1	2	#6
(22) 254-14	2	1/4"
Miscellaneous		
(23) 259-6	5	#6 solder lug
(24) 260-29	1	Crystal clip
(25) 435-1	2	Mounting ring
WIRE-CABLES		
344-59	1	Hookup wire
347-1	1	8-wire cable
343-2	1	Shielded cable
CRYSTAL-TUBES		
404-250	1	38.66666 mc crystal
411-124	1	6EA8 tube
411-208	1	6DJ8 tube

PART No.	PARTS Per Kit	DESCRIPTION
TERMINAL STRIP-SOCKETS-PLUGS		
431-49	1	11-lug terminal strip
(26) 434-4	2	Octal socket
(27) 434-36	2	9-pin tube socket
(28) 434-74	1	Crystal socket
(29) 434-107	2	Phono socket
(30) 438-4	3	Phono plug
(31) 438-6	2	Octal plug
MISCELLANEOUS		
206-3	2	Tube shield
261-4	4	Rubber feet
200-420-2	1	Chassis
201-32	1	Chassis base
(32) 440-1	2	Octal plug cap
490-1	1	Alignment tool
331-6		Solder
595-712	1	Manual

Refer to Pictorial 6 for the following steps.

( ) Locate the length of 8-wire cable and prepare each end as shown in the Pictorial.

( ) Remove 1/4" of insulation from the end of each inner wire and apply a small amount of solder to the bared ends. This will hold the small wire strands together.

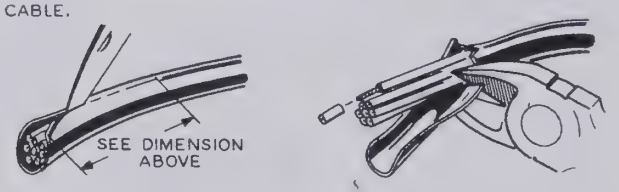
( ) Place an octal cap over each cable end, then connect the wires at each end of the cable to the octal socket and plug as shown.

( ) Check all the connections at each end of the cable. Be sure none of them are shorted out due to solder splashes.

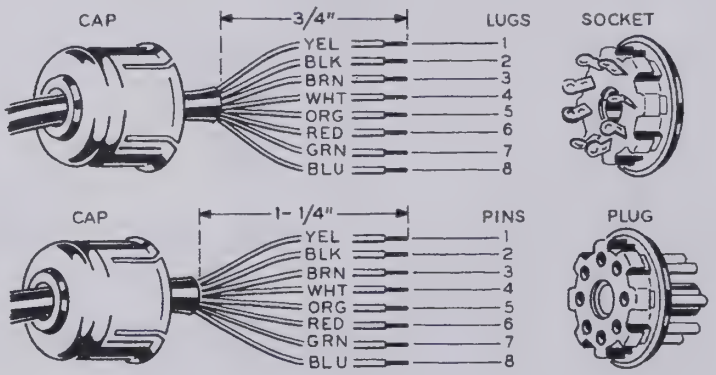
( ) Snap the caps onto the octal plug and socket.

( ) Set this cable aside to be used later.

TAKING CARE NOT TO CUT THE INNER LEADS REMOVE THE OUTER INSULATION OF THE CABLE.



REMOVE 1/4" OF INSULATION FROM THE END OF EACH INNER LEAD. APPLY A SMALL AMOUNT OF SOLDER TO THE BARED WIRE ENDS. THEN CONNECT THE LONGER LEADS TO THE OCTAL PLUG AND THE SHORTER LEADS TO THE OCTAL SOCKET AS FOLLOWS.



PICTORIAL 6

INITIAL TEST AND ADJUSTMENT

NOTE: This Converter was designed for use with the Heathkit SB-300 Receiver, but it can also be used with other receivers that tune the 10-meter band, and provide suitable filament, B+, and AGC voltages. These voltages should be connected to the octal plug of the power cable as follows:

Pin 8 Filament, 6.3 volts at 815 milliamperes.
Pin 2 Ground.
Pin 6 B+, 130 volts at 12.5 milliamperes.
Pin 4 AGC 0.7 to 9.0 volts (-DC).
Pin 7 Ground.

The following adjustments are made with the Converter connected to a Heathkit SB-300 Receiver that is operating, and properly aligned. An 11 megohm input VTVM will be needed for some of these adjustments.

( ) Set the SB-300 Receiver front panel controls as follows:

AGC - OFF.
MODE - AM.
FUNCTION - STBY.
BAND - 28.5.
AF GAIN - Fully counterclockwise.
RF GAIN - Fully clockwise.
SLIDE RULE DIAL - On 1.
CIRCULAR DIAL - On 0.

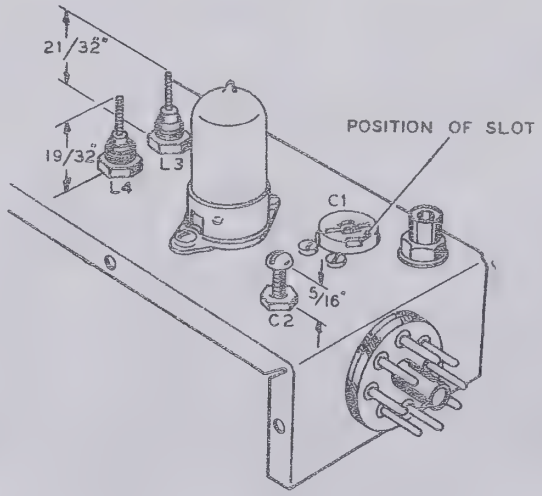
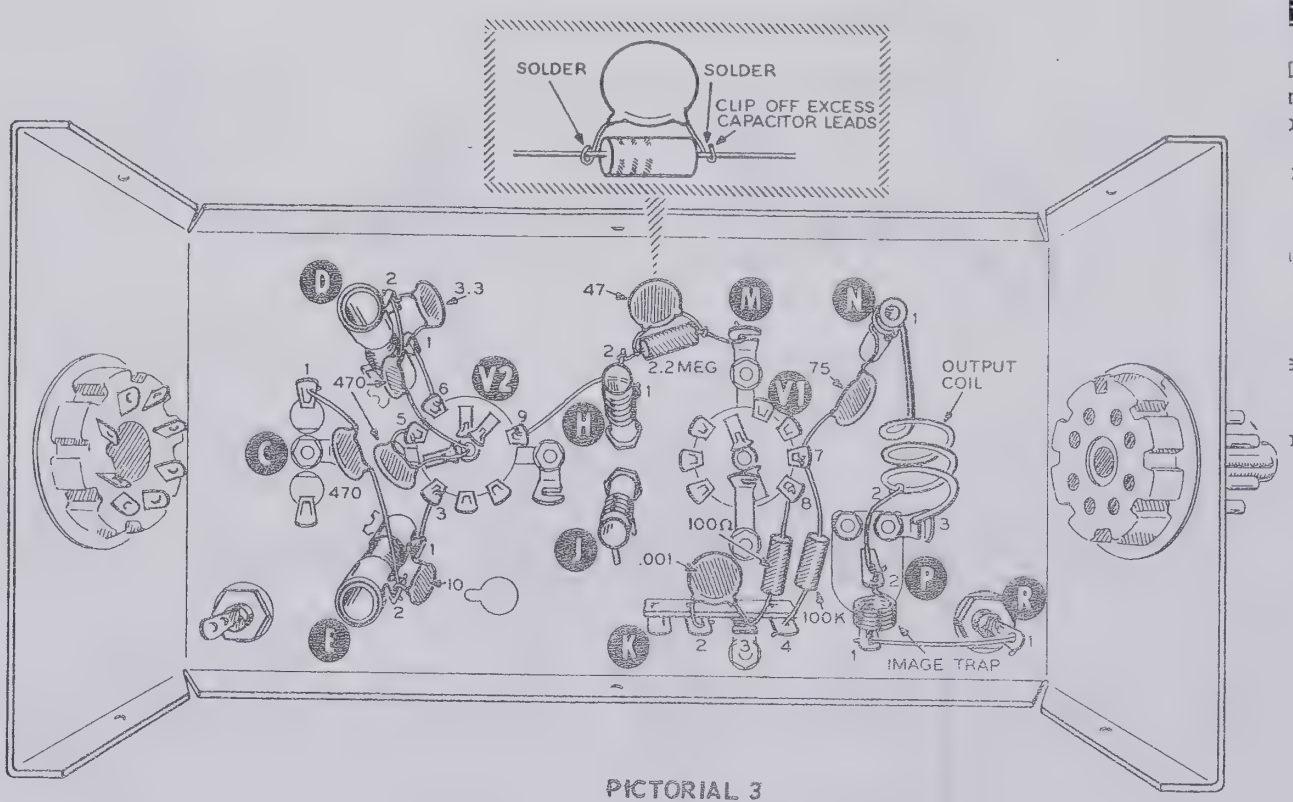


Figure 1

( ) Referring to Figure 1, preset coils L3 and L4, and capacitors C1 and C2 as shown.

( ) Connect the power cable prepared previously, from the Receiver socket to the Converter plug.


SOLDER
SOLDER
CLIP OFF EXCESS CAPACITOR LEADS
D
2
3.3
1
V2
6
5
9
C
470
470
3
1
10
2
G
47
M
2
2.2MEG
1
H
J
N
1
75
OUTPUT COIL
M
7
8
100Ω
.001
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3
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2
100K
K
2
3
4
1
IMAGE TRAP
R
1

PICTORIAL 3

NOTE:
SB-300
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and AG
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Pin 8
Pin 2
Pin 6
Pin 4
Pin 7

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AG
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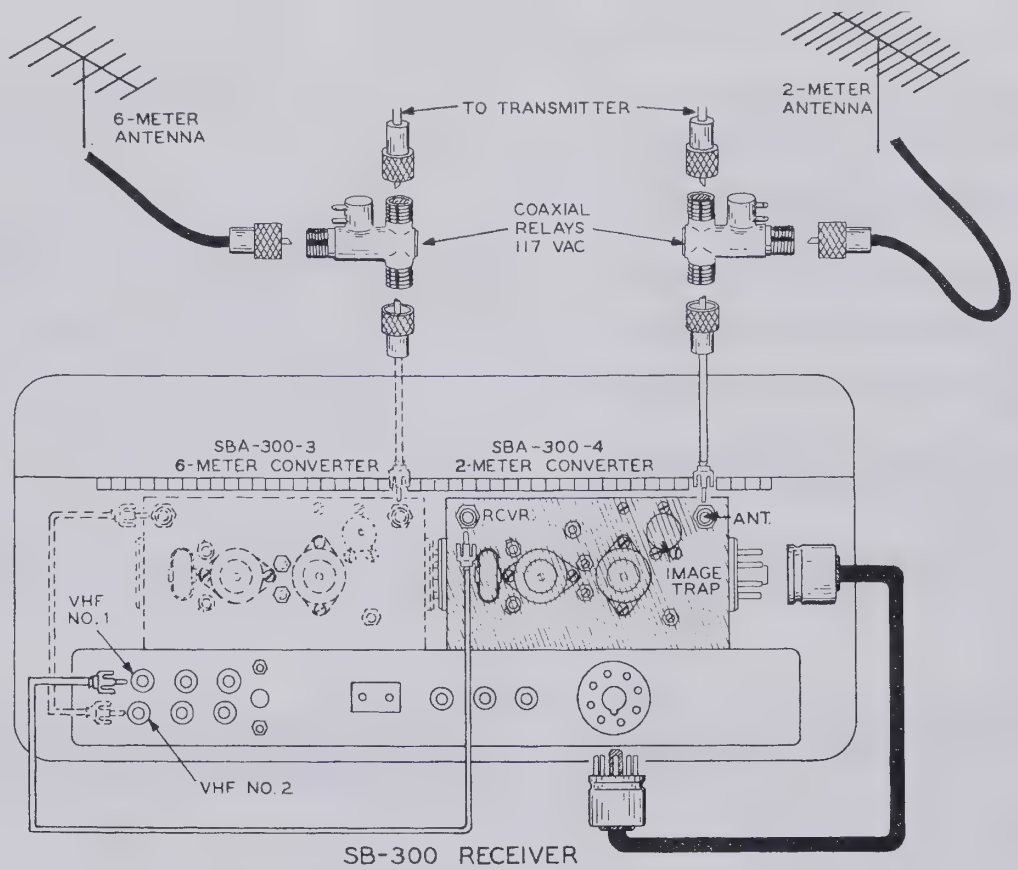


PICTORIAL 9

( ) Set the Receiver Converter switch to VHF No. 1. With the Converter switch in this position, filament and B+ voltages are applied to the Converter. The filaments of the Converter tubes should light.

( ) If there is any sign of overheating components, turn the Receiver Converter switch to the HF position to remove filament and B+ voltages from the Converter. If no difficulty is encountered, proceed with the following steps.

( ) Install the tube shields over the Converter tubes.

( ) Set the Receiver Function switch to OPR (operate).

( ) Set the VTVM to read -DC volts on the 15 volt or higher range.

( ) Connect the DC probe of the VTVM to lug 2 of coil L4 (coil H) and connect the common VTVM lead to the Converter chassis. Refer to Pictorial 3 for the coil lug location.

( ) Using the alignment tool supplied, adjust oscillator coils L6 and L7 for a maximum VTVM reading.

( ) Disconnect the VTVM test leads from the Converter.

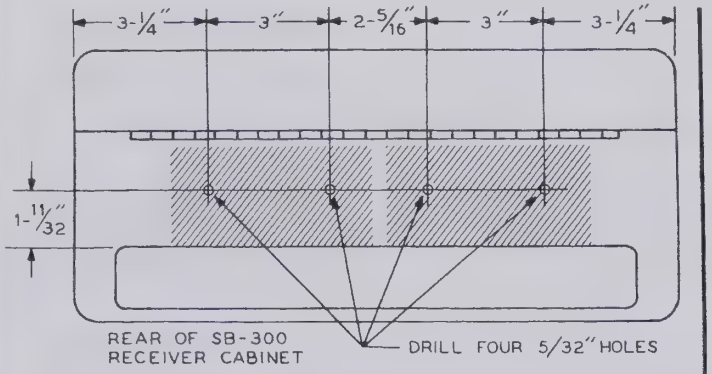
( ) Set the Receiver Function switch to OFF.

( ) Disconnect the Converter power cable from the Receiver socket.

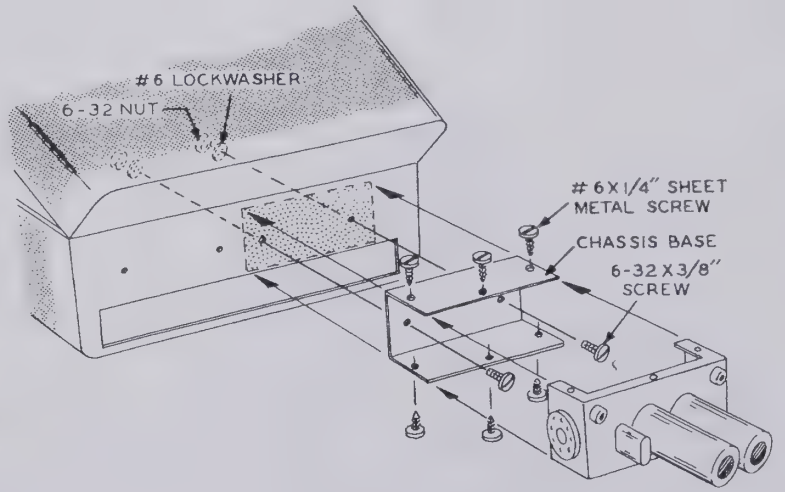
This completes the Initial Test and Adjustment of the Converter. Proceed with the Installation section.

INSTALLATION

NOTE: Permanent and Alternate Mounting instructions are given. Use the permanent mounting section if you prefer to have the Converter attached to the rear of your SB-300 Receiver; if you do not want the Converter attached to the Receiver, use the Alternate Mounting section.



Detail 7A



PICTORIAL 7

PERMANENT MOUNTING

NOTE: Some early model SB-300 Receiver Cabinets do not have holes in the back of the cabinet for the Converter installation. If your cabinet does not have these holes, use Detail 7A to locate and drill the holes needed for Converter mounting. Be sure to remove the receiver from the cabinet before drilling the holes.

Refer to Pictorial 7 for the following steps.

( ) Install the chassis base to the rear of the receiver cabinet. Use two 6-32 x 3/8" screws, #6 lockwashers, and 6-32 nuts.

( ) Install the chassis to the chassis base, using six #6 x 1/4" sheet metal screws. Make sure the hookup wires are pushed away from the screw holes in the chassis before tightening the screws.

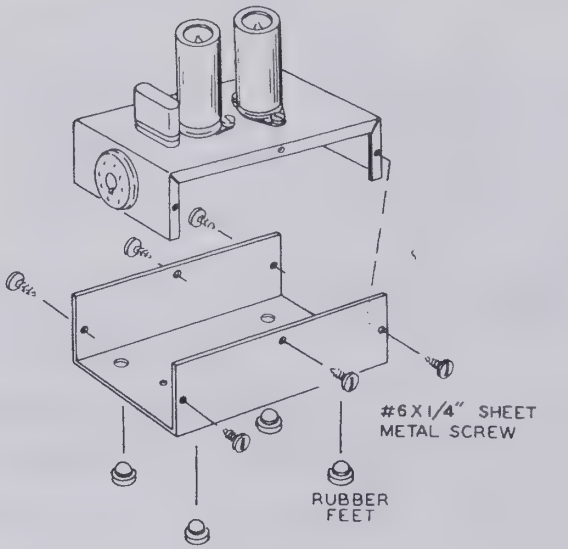
( ) Install the Receiver chassis into the cabinet.

ALTERNATE MOUNTING

Refer to Pictorial 8 for the following steps.

( ) Install the four rubber feet to the bottom of the chassis base.

( ) Install the chassis to the chassis base, using six #6 x 1/4" sheet metal screws. Make sure the hookup wires are pushed away from the screw holes in the chassis before tightening the screws.



PICTORIAL 8

CABLE HOOKUP

Refer to Pictorial 9 (fold-out from Page 22) for the following steps.

( ) Connect the power cable from the Converter to the Receiver socket.

( ) Connect the prepared shielded cable from the RCVR socket of the Converter to the VHF No. 1 socket of the SB-300 Receiver.

( ) Connect your 2-meter antenna to the ANT socket of the Converter.

Pictorial 9 shows all the cable connections for using the SBA-300-4, 2-Meter Converter with the SB-300 Receiver. Connections for the SBA-300-3, 6-Meter Converter (available as a separate kit) are shown by dotted lines.

OPERATION

IMAGE TRAP ADJUSTMENT

( ) Tune the receiver across the 2-meter band. If an IF image appears at the high or low end of the band (this would be an FM broadcast station near your locality), turn image trap adjustment C1 for minimum signal leak-through. If more than one image appears, adjust the image trap for minimum signal on the stronger image, or adjust the image trap between the two stronger signals.

ANTENNA TRIMMER ADJUSTMENT

( ) Adjust trimmer capacitor C2 for the best signal-to-noise ratio when tuned to a weak 2-meter signal.

Instrument alignment should not be required, as the previous adjustments of the coils and capacitors should provide Converter operation equal to or better than the specifications. In case you have the necessary equipment, and prefer instrument alignment, refer to Page 26 and 27 of this Manual.

CRYSTAL INFORMATION

The 38.66666 megacycle crystal supplied with the Converter provides reception from 144 to 146 megacycles. Other crystal frequencies can be used to cover different 2-megacycle segments between 142 and 150 megacycles. The following chart lists some of the crystal frequencies that can be used. In each case, the output frequency of the Converter is between 28 and 30 mc, which corresponds to 10-meter reception with the SB-300 Receiver.

CRYSTAL CHART

(Frequencies in megacycles)

CONVERTER CRYSTAL	COVERAGE
38	142 to 144
38.66666	144 to 146
39.33333	146 to 148
40	148 to 150

When purchasing a crystal for use with this Converter, you should specify the frequency and the following crystal characteristics. Crystals that do not have these characteristics will not provide optimum performance.

Load capacitance (C1): 19.1 $\mu\mu$f

Internal capacity (Co): 7 $\mu\mu$f, maximum

Series resistance (Rs): 30 Ω, maximum

Drive level: 10 millivolts

Mode of operation: 3rd overtone

Also, if you install a crystal other than the 38.66666 megacycle crystal supplied, it will be necessary to readjust oscillator coils L6 and L7 as directed in the Initial Test And Adjustment section of the manual.

INSTRUMENT ALIGNMENT

Instrument alignment of the Converter is not required for normal operation; however, if you have access to the necessary test equipment, complete instrument alignment will assure optimum performance. A signal generator that covers 142 to 150 megacycles and a vacuum tube voltmeter will be needed.

( ) Connect the vacuum tube voltmeter to the speaker terminals of the Receiver. Set the vacuum tube voltmeter to the 1.5 volt AC range.

( ) Set the SB-300 Receiver controls as follows:

AGC - OFF.
MODE - AM.
FUNCTION - OPR.
RF GAIN - Fully clockwise.
Slide rule dial - 1.
Circular dial - 0.
Converter switch - VHF No. 1.

( ) Unplug the antenna and connect the signal generator output to the Converter ANT socket.

( ) Set the signal generator for 30% modulation, and keep the signal output level at 3 microvolts during alignment.

Now align the Converter as directed in the Instrument Alignment Chart.

NOTE: The signal generator frequencies given in the Instrument Alignment Chart are for use with a 38.66666 megacycle crystal in the Converter. If you have a different frequency crystal in the Converter, it will be necessary to change the signal generator frequencies accordingly.

For example: Step 1 in the Instrument Alignment Chart calls for a signal generator frequency of 145.0 megacycles. If you are using a 40 megacycle crystal, you should set the signal generator to 147.0 megacycles (+2 megacycles).

INSTRUMENT ALIGNMENT CHART

	SB-300 BAND	SB-300 AF GAIN	SB-300 PRE-SELECTOR	SIGNAL GENERATOR (400 cps with 30% modulation)	SB-300 CIRCULAR DIAL	CONVERTER ADJUSTMENTS					
						L5	L6	L7	L3 and L4	C1	C2
1	29.0 MC	3/4 OF ROTATION	MAXIMUM VTVM READING (NOISE)	145.0 MC	MAXIMUM VTVM READING	MAXIMUM VTVM READING	ADJUST L6 AND SB-300 CIRCULAR DIAL FOR MAXIMUM VTVM READING	MAXIMUM VTVM READING			
2	28.0 MC	3/4 OF ROTATION	MAXIMUM VTVM READING (NOISE)	144.0 MC	MAXIMUM VTVM READING				ADJUST L3 FOR MAXIMUM VTVM READING		
3	30.0 MC	3/4 OF ROTATION	MAXIMUM VTVM READING (NOISE)	146.0 MC	MAXIMUM VTVM READING				ADJUST L4 FOR MAXIMUM VTVM READING		
4	28.25 MC	ADJUST FOR SOME REFERENCE LEVEL ON VTVM	MAXIMUM VTVM READING (NOISE)	144.25 MC	MAXIMUM VTVM READING				ADJUST L3 FOR MAXIMUM VTVM READING	REPEAT THESE TWO STEPS FOR MAXIMUM VTVM READINGS. READINGS SHOULD NOT VARY MORE THAN 3 TO 4 DB BETWEEN THESE TWO FREQUENCY SETTINGS.	
5	29.75 MC	DO NOT CHANGE OBSERVE READING ON VTVM	MAXIMUM VTVM READING (NOISE)	145.75 MC	MAXIMUM VTVM READING				ADJUST L4 FOR MAXIMUM VTVM READING		
6	29.0 MC	3/4 OF ROTATION	MAXIMUM VTVM READING (NOISE)	87 MC (GENERATOR AT MAXIMUM OUTPUT)	MAXIMUM VTVM READING					MINIMUM VTVM READING	
7	28.0 MC	3/4 OF ROTATION	MAXIMUM VTVM READING (NOISE)	DISCONNECT SIGNAL GENERATOR AND CONNECT ANTENNA	TUNE FOR ON-THE-AIR SIGNAL						ADJUST FOR BEST SIGNAL TO NOISE RATIO

IN CASE OF DIFFICULTY

NOTE: Refer to the Kit Builders Guide for Warranty information.

1. Recheck the wiring. Trace each lead in colored pencil on the Pictorial as it is checked. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something consistently overlooked by the constructor.

2. It is interesting to note that about 90% of the kits that are returned for repair, do not function properly due to poor connections and soldering. Therefore, many troubles can be eliminated by reheating all connections to make sure that they are soldered as described in the Proper Soldering Techniques section of this manual.

3. Check the values of the parts. Be sure that the proper part has been wired into the circuit, as shown in the pictorial diagrams and as called out in the wiring instructions.

4. Check for bits of solder, wire ends or other foreign matter which may be lodged in the wiring.

5. If, after careful checks, the trouble is still not located and a voltmeter is available, check voltage readings against those shown on the Schematic Diagram. NOTE: All voltage readings were taken with an 11 megohm input vacuum tube voltmeter. Voltages may vary as much as 10%.

6. A review of the Circuit Description will prove helpful in indicating where to look for trouble.

SERVICE INFORMATION

SERVICE

If, after applying the information in this manual and your best efforts, you are still unable to obtain proper performance, it is suggested that you take advantage of the technical facilities which the Heath Company makes available to its customers.

The Technical Consultation Department is maintained for your benefit. This service is available to you at no charge. Its primary purpose is to provide assistance for those who encounter difficulty in the construction, operation or maintenance of HEATHKIT equipment. It is not intended, and is not equipped to function as a general source of technical information involving kit modifications nor anything other than the normal and specified performance of HEATHKIT equipment.

Although the Technical Consultants are familiar with all details of this kit, the effectiveness of their advice will depend entirely upon the amount and the accuracy of the information furnished by you. In a sense, YOU MUST QUALIFY for GOOD technical advice by helping the consultants to help you. Please use this outline:

1. Before writing, fully investigate each of the hints and suggestions listed in this manual under In Case Of Difficulty. Possibly it will not be necessary to write.
2. When writing, clearly describe the nature of the trouble and mention all associated equipment. Specifically report operating procedures, switch positions, connections to other units, and anything else that might help to isolate the cause of trouble.
3. Report fully on the results obtained when testing the unit initially and when following the suggestions under In Case Of Difficulty. Be as specific as possible and include voltage readings if test equipment is available.
4. Identify the kit Model Number and Series Number, and date of purchase, if available. Also mention the date of the kit assembly manual. (Date at bottom of Page 1.)
5. Print or type your name and address, preferably in two places on the letter.

With the preceding information, the consultant will know exactly what kit you have, what you would like it to do for you and the difficulty you wish to correct. The date of purchase tells him whether or not engineering changes have been made since it was shipped to you. He will know what you have done in an effort to locate the cause of trouble and, thereby, avoid repetitious suggestions. In short, he will devote full time to the problem at hand, and through his familiarity with the kit, plus your accurate report, he will be able to give you a complete and helpful answer. If replacement parts are required, they will be shipped to you, subject to the terms of the Warranty.

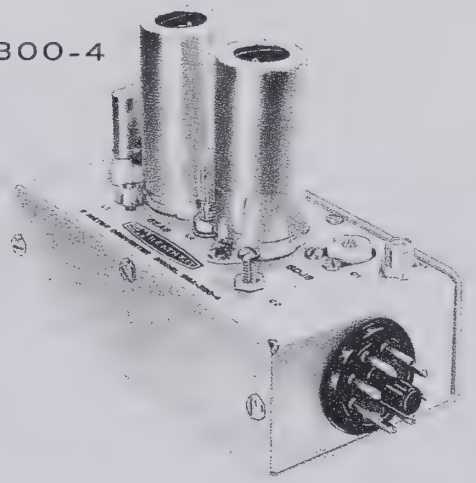
CONDENSED

Assembly and Operation of the

HEATHKIT

2-METER CONVERTER

MODEL SBA-300-4



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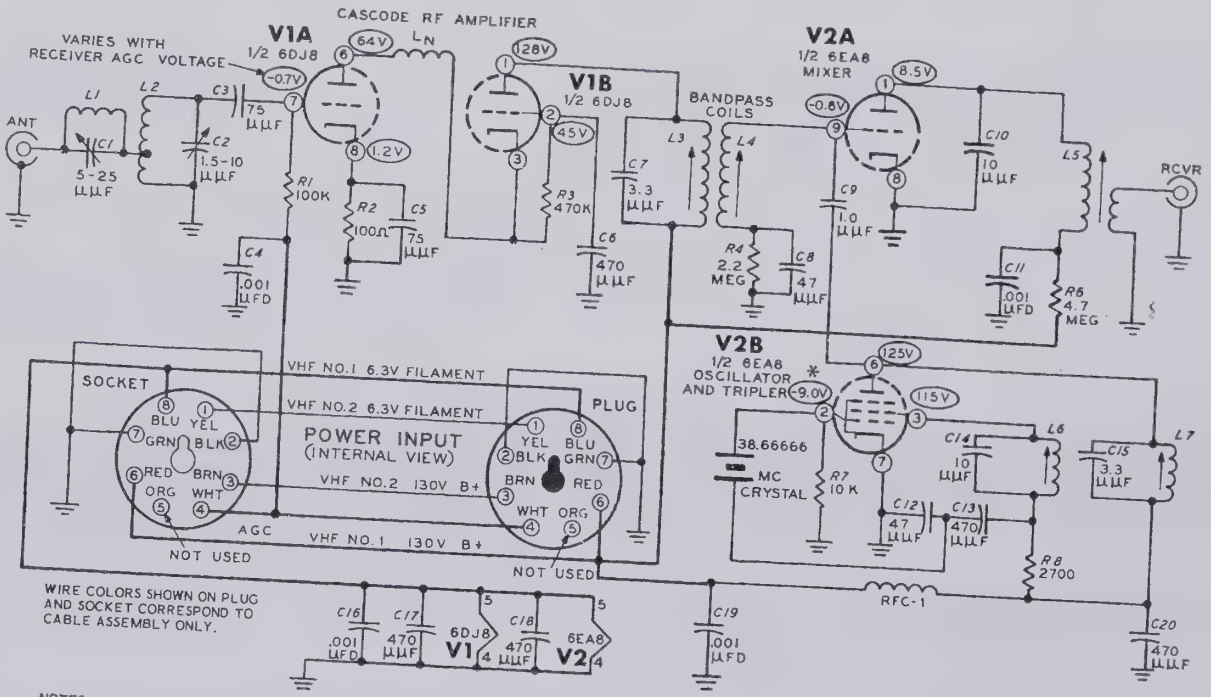
HEATH COMPANY

BENTON HARBOR, MICHIGAN

1-19-68

SPECIFICATIONS

Sensitivity. . . . . (Signal plus noise-to-noise in db)	AM: Less than 0.2 microvolt for 6 db at 3750 cps bandwidt SSB: Less than 0.2 microvolt for 12 db at 2100 cps bandwidt CW: Less than 0.2 microvolt for 20 db at 400 cps bandwidt (Using Heathkit SB-300 Receiver.)
Noise Figure.	7 db or less.
Bandpass.	Essentially flat over any 2 megacycle segment from 142 150 megacycles.
Frequency.	Input: 142 to 150 megacycles (144 to 146 megacycles wi crystal supplied). Output: 28 to 30 megacycles.
Image Rejection.	80 db or better at 88 megacycles.
IF Rejection.	50 db or better at 29 megacycles.
Crystal.	38.66666 megacycles ±.003%, 3rd overtone.
Tube Complement.	6DJ8 cascode RF amplifier. 6EA8 oscillator-tripler-mixer.
Power Requirements.	130 volts DC at 12.5 milliamperes. 6.3 volts AC at 815 milliamperes.



WIRE COLORS SHOWN ON PLUG AND SOCKET CORRESPOND TO CABLE ASSEMBLY ONLY.

NOTES:

ALL RESISTORS ARE 1/2 WATT.
ALL RESISTOR VALUES ARE IN OHMS (K = 1000, MEG = 1,000,000).
(oval) INDICATES VOLTAGE READING.
ALL VOLTAGES ARE DC POSITIVE UNLESS MARKED OTHERWISE.
ALL VOLTAGES ARE MEASURED FROM POINT INDICATED TO CHASSIS GROUND AND MAY VARY ±10%.
VOLTAGE READINGS TAKEN WITH AN 11 MEGOHM VTVM, WITH NO SIGNAL INPUT.
POWER INPUT LINES LABLED VHF NO. 2 RECEIVE POWER WHEN RECEIVER CONVERTER SWITCH IS IN VHF NO. 2 POSITION.
POWER INPUT LINES LABLED VHF NO. 1 RECEIVE POWER WHEN RECEIVER CONVERTER SWITCH IS IN VHF NO. 1 POSITION.
* VARIES WITH CRYSTAL ACTIVITY.

SCHEMATIC OF THE HEATHKIT® 2-METER CONVERTER MODEL SBA-300-4

Dimensions	Overall: 2-5/8" wide x 5-3/4" long x 3-3/4" high.
Net Weight	10-1/2 oz.
Test Equipment Used In Preparing Specifications Measurements, And Alignment Instructions	Measurements Corporation Model 80 Standard Signal Generator (with 50 Ω pad). Heathkit Model IM-13 Vacuum Tube Voltmeter.

The Heath Company reserves the right to discontinue instruments and to change specifications at any time without incurring any obligation to incorporate new features in instruments previously sold.

INTRODUCTION

The Heathkit Model SBA-300-4, 2-Meter Converter is designed to extend the frequency coverage of the Heathkit SB-300 Receiver to include 142 to 150 megacycles (144 to 146 megacycles with the 38.66666 megacycle crystal supplied). The Converter receives its filament, B+, and AGC voltages from the receiver through a power cable. The power cable connections for the Converter are switched by the Converter switch in the SB-300 Receiver.

A separate power socket on the Converter chassis provides power for the Heathkit Model SBA-300-3, 6-Meter Converter. Either one or both of these converters can be mounted on the rear of the SB-300 Receiver cabinet for a neat, easy installation.

The Converter circuit consists of a cascode RF amplifier, a crystal-controlled oscillator-tripler, and a mixer stage. The 2-stage RF amplifier provides low noise, plus excellent sensitivity characteristics; the crystal-controlled oscillator provides drift-free operation.

Although this Converter is designed for use with the Heathkit SB-300 Receiver, it can be used equally well with any other receiver that has similar characteristics and tunes from 28 to 30 megacycles.

The SBA-300-4 Converter and SB-300 Receiver combination provides high-sensitivity, high-stability, and low-noise VHF reception of AM, SSB, and CW signals in the 2-meter band.

CIRCUIT DESCRIPTION

Refer to the Schematic Diagram while reading the following Circuit Description.

CASCODE RF AMPLIFIER

Tube stages V1A and V1B are connected as an untuned cascode RF amplifier; V1A is a grounded-cathode stage, and V1B is a grounded-grid stage. The signal from the antenna is coupled across image trap coil L1, input coil L2, and through coupling capacitor C3 to the grid of tube V1A. Image trap coil L1 is adjusted to reject signals at 88 megacycles, while allowing the desired operating frequencies to pass. Input coil L2 is tapped to provide a 50 Ω antenna input impedance.

In tube V1A, the signal is amplified and then coupled to the cathode of tube V1B through L_N. Tube stage V1A is neutralized by L_N for optimum signal-to-noise ratio. After further amplification in V1B, the signal is coupled through bandpass coils L3 and L4. These coils are placed physically close together so they operate as a transformer; L3 serves as the primary and L4 as the secondary of the transformer. This circuit presents a high impedance to 143-149 megacycle signal frequencies, and is almost a short circuit to any other received signal frequencies that may be amplified by the cascode RF amplifier.

MIXER-OSCILLATOR-TRIPLER

The signal from coil L4 is directly coupled to the grid of tube V2A, which is used as a low-noise mixer. The oscillator signal from V2B is also applied to the grid of mixer V2A. The incoming signal frequency and the oscillator frequency are mixed V2A to produce an IF signal (28 to 30 megacycles). The pla circuit of V2A is tuned to the 29 megacycle IF midpoint by c: pacitor C10 and coil L5. The IF signal is coupled from cc L5 to the receiver antenna input by a link winding on coil L This coil provides a 50 Ω output impedance to match the re ceiver antenna input impedance.

Tube V2B is a crystal-controlled oscillator stage. The gri and screen circuits of V2B form the oscillator. A 38.6666 megacycle 3rd overtone crystal, coil L6, and capacitor C1 control the oscillator frequency. The plate circuit is tuned t the third harmonic of the crystal frequency by coil L7 an capacitor C15. This 115.999 megacycle signal is couple through capacitor C9 to the grid of mixer tube V2A. (Th 38.66666 megacycle crystal provides coverage between 14 and 146 megacycles. A 38, 39.333, or 40 megacycle crysta may also be used to cover 2 megacycle segments below anc above the 144 to 146 megacycle range.)

POWER

Filament, B+, and AGC voltages are provided by the receiver through a cable assembly. The VHF No. 1 position of the SB-300 Receiver Converter switch applies power to the Converter through lugs 6 and 8 of the plug and socket. In the VHF No. 2 position, power is applied through lugs 1 and 3 of the octal plug and socket for use with a 6-Meter Converter. AGC voltage is applied through lug 4 and is not switched.

PARTS LIST

The numbers in parentheses in the Parts List are keyed to the numbers on the Parts Pictorial to aid in parts identification.

PART No.	PARTS Per Kit	DESCRIPTION
RESISTORS-1/2 WATT		
(1) 2-149	1	.900 Ω precision
(2) 1-3	1	100 Ω (brown-black-brown)
1-13	1	2700 Ω (red-violet-red)
1-20	1	10 KΩ (brown-black-orange)
1-26	1	100 KΩ (brown-black-yellow)
1-33	1	470 KΩ (yellow-violet-yellow)
1-37	1	2.2 megohm (red-red-green)
1-39	1	4.7 megohm (yellow-violet-green)
CAPACITORS		
(3) 21-33	2	3.3 μμf disc
21-3	2	10 μμf disc
21-32	2	47 μμf disc
21-54	2	75 μμf disc
21-56	5	470 μμf disc
21-14	4	.001 μfd disc
(4) 28-2	1	1.0 μμf tubular (brown-black-white)
(5) 31-17	1	5-25 μμf trimmer
(6) 31-21	1	1.5 - 10 μμf ceramic trimmer

PART No.	PARTS Per Kit	DESCRIPTION
COILS		
(7) 40-203	2	Bandpass (with lockwasher and nut)
(8) 40-209	1	Image trap
(9) 40-326	1	RF
(10) 40-612	1	Multiplier
40-622	1	Oscillator
40-623	1	Output
(11) 45-37	1	Choke
HARDWARE		
Screws		
(12) 250-170	6	#6 x 1/4" sheet metal
(13) 250-49	7	3-48 x 1/4"
(14) 250-133	1	3-48 x 7/16"
(15) 250-89	2	6-32 x 3/8"
(16) 250-134	1	6-32 x 3/4"
Nuts		
(17) 252-1	8	3-48
(18) 252-3	2	6-32
(19) 252-19	1	6-32 palnut

PART No.	PARTS Per Kit	DESCRIPTION
Lockwashers		
(20) 254-7	14	#3
(21) 254-1	2	#6
(22) 254-14	2	1/4"
Miscellaneous		
(23) 259-6	5	#6 solder lug
(24) 260-29	1	Crystal clip
(25) 435-1	2	Mounting ring
WIRE-CABLES		
344-59	1	Hookup wire
347-1	1	8-wire cable
343-2	1	Shielded cable
CRYSTAL-TUBES		
404-250	1	38.66666 mc crystal
411-124	1	6EA8 tube
411-208	1	6DJ8 tube

PART No.	PARTS Per Kit	DESCRIPTION
TERMINAL STRIP-SOCKETS-PLUGS		
431-49	1	11-lug terminal strip
(26) 434-4	2	Octal socket
(27) 434-36	2	9-pin tube socket
(28) 434-74	1	Crystal socket
(29) 434-107	2	Phono socket
(30) 438-4	3	Phono plug
(31) 438-6	2	Octal plug
MISCELLANEOUS		
206-3	2	Tube shield
261-4	4	Rubber feet
200-420-2	1	Chassis
201-32	1	Chassis base
(32) 440-1	2	Octal plug cap
490-1	1	Alignment tool
331-6		Solder
595-712	1	Manual

Refer to Pictorial 6 for the following steps.

( ) Locate the length of 8-wire cable and prepare each end as shown in the Pictorial.

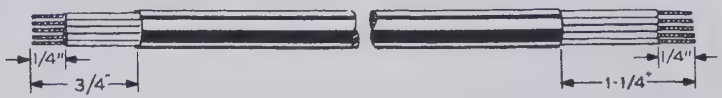
( ) Remove 1/4" of insulation from the end of each inner wire and apply a small amount of solder to the bared ends. This will hold the small wire strands together.

( ) Place an octal cap over each cable end, then connect the wires at each end of the cable to the octal socket and plug as shown.

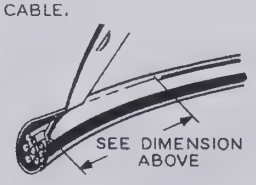
( ) Check all the connections at each end of the cable. Be sure none of them are shorted out due to solder splashes.

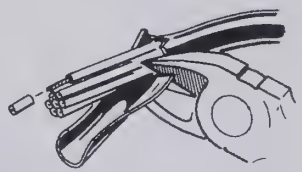
( ) Snap the caps onto the octal plug and socket.

( ) Set this cable aside to be used later.

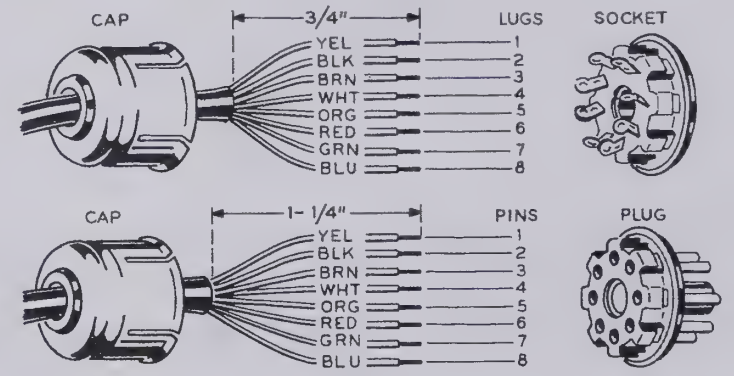


TAKING CARE NOT TO CUT THE INNER LEADS REMOVE THE OUTER INSULATION OF THE CABLE.





REMOVE 1/4" OF INSULATION FROM THE END OF EACH INNER LEAD. APPLY A SMALL AMOUNT OF SOLDER TO THE BARED WIRE ENDS. THEN CONNECT THE LONGER LEADS TO THE OCTAL PLUG AND THE SHORTER LEADS TO THE OCTAL SOCKET AS FOLLOWS.



PICTORIAL 6

INITIAL TEST AND ADJUSTMENT

NOTE: This Converter was designed for use with the Heathkit SB-300 Receiver, but it can also be used with other receivers that tune the 10-meter band, and provide suitable filament, B+, and AGC voltages. These voltages should be connected to the octal plug of the power cable as follows:

Pin 8 Filament, 6.3 volts at 815 milliamperes.
Pin 2 Ground.
Pin 6 B+, 130 volts at 12.5 milliamperes.
Pin 4 AGC 0.7 to 9.0 volts (-DC).
Pin 7 Ground.

The following adjustments are made with the Converter connected to a Heathkit SB-300 Receiver that is operating, and properly aligned. An 11 megohm input VTVM will be needed for some of these adjustments.

( ) Set the SB-300 Receiver front panel controls as follows:

AGC - OFF.
MODE - AM.
FUNCTION - STBY.
BAND - 28.5.
AF GAIN - Fully counterclockwise.
RF GAIN - Fully clockwise.
SLIDE RULE DIAL - On 1.
CIRCULAR DIAL - On 0.

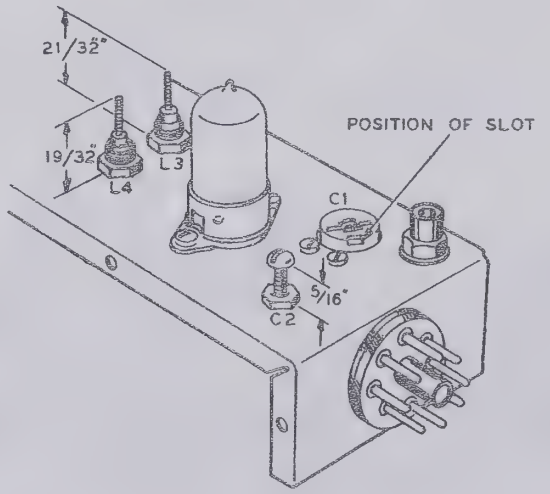
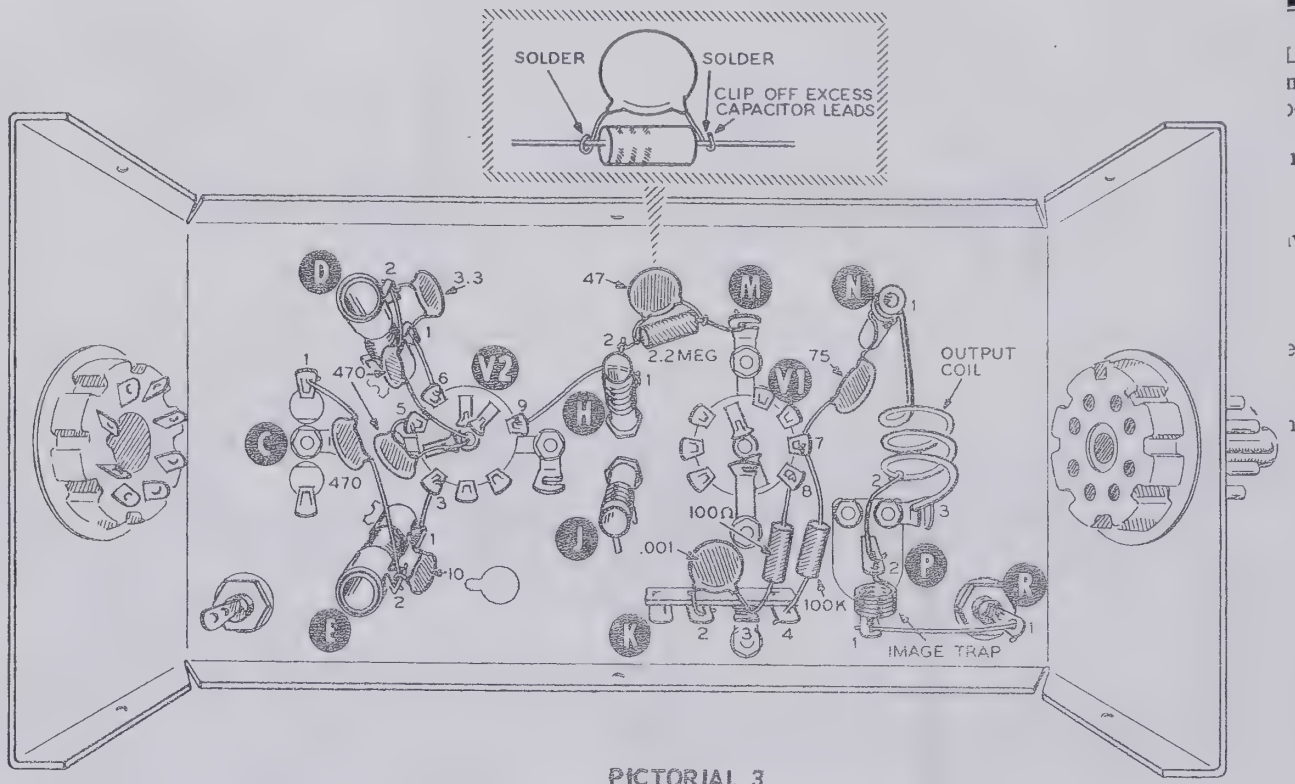


Figure 1

( ) Referring to Figure 1, preset coils L3 and L4, and capacitors C1 and C2 as shown.

( ) Connect the power cable prepared previously, from the Receiver socket to the Converter plug.


SOLDER
SOLDER
CLIP OFF EXCESS CAPACITOR LEADS
D
2
3.3
1
V2
1
470
6
5
9
C
470
3
1
10
2
E
47
M
2
2.2MEG
1
H
J
.001
100Ω
N
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75
OUTPUT COIL
VI
7
8
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4
100K
1
IMAGE TRAP

PICTORIAL 3

NOTE:
SB-300
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Pin 8
Pin 2
Pin 6
Pin 4
Pin 7

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( ) Set

AG
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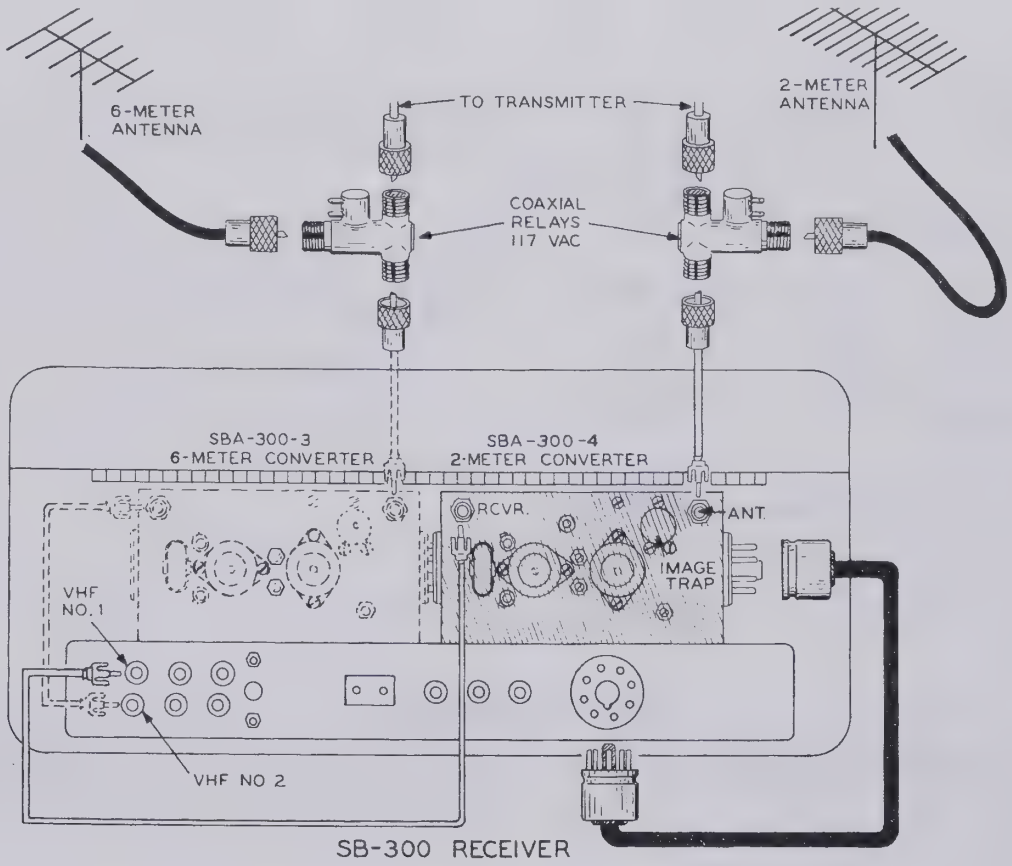


PICTORIAL 9

( ) Set the Receiver Converter switch to VHF No. 1. With the Converter switch in this position, filament and B+ voltages are applied to the Converter. The filaments of the Converter tubes should light.

( ) If there is any sign of overheating components, turn the Receiver Converter switch to the HF position to remove filament and B+ voltages from the Converter. If no difficulty is encountered, proceed with the following steps.

( ) Install the tube shields over the Converter tubes.

( ) Set the Receiver Function switch to OPR (operate).

( ) Set the VTVM to read -DC volts on the 15 volt or higher range.

( ) Connect the DC probe of the VTVM to lug 2 of coil L4 (coil H) and connect the common VTVM lead to the Converter chassis. Refer to Pictorial 3 for the coil lug location.

( ) Using the alignment tool supplied, adjust oscillator coils L6 and L7 for a maximum VTVM reading.

( ) Disconnect the VTVM test leads from the Converter.

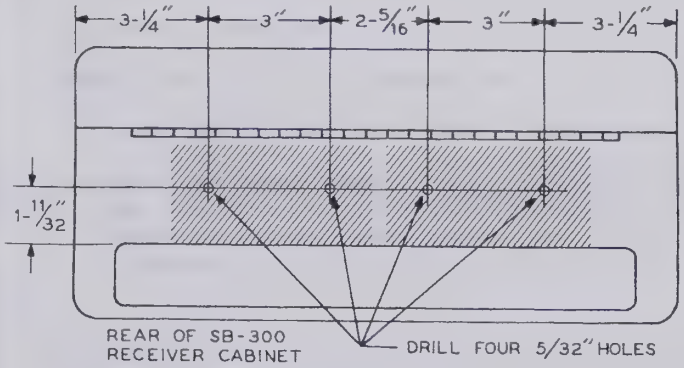
( ) Set the Receiver Function switch to OFF.

( ) Disconnect the Converter power cable from the Receiver socket.

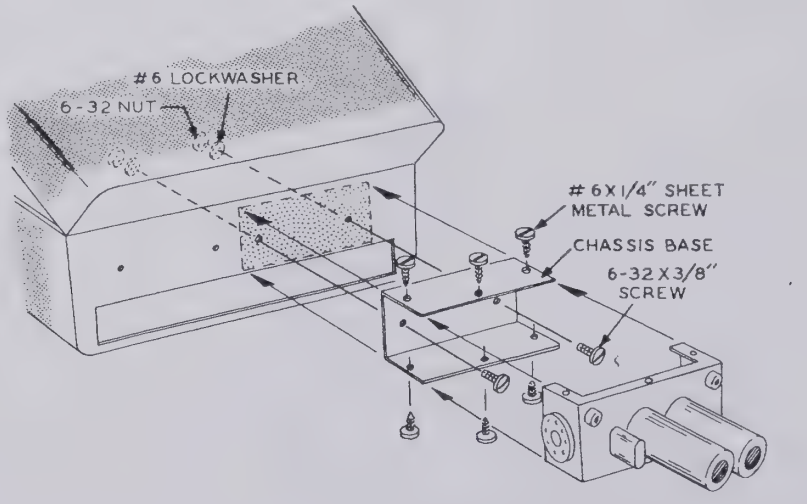
This completes the Initial Test and Adjustment of the Converter. Proceed with the Installation section.

INSTALLATION

NOTE: Permanent and Alternate Mounting instructions are given. Use the permanent mounting section if you prefer to have the Converter attached to the rear of your SB-300 Receiver; if you do not want the Converter attached to the Receiver, use the Alternate Mounting section.



Detail 7A



PICTORIAL 7

PERMANENT MOUNTING

NOTE: Some early model SB-300 Receiver Cabinets do not have holes in the back of the cabinet for the Converter installation. If your cabinet does not have these holes, use Detail 7A to locate and drill the holes needed for Converter mounting. Be sure to remove the receiver from the cabinet before drilling the holes.

Refer to Pictorial 7 for the following steps.

( ) Install the chassis base to the rear of the receiver cabinet. Use two 6-32 x 3/8" screws, #6 lockwashers, and 6-32 nuts.

( ) Install the chassis to the chassis base, using six #6 x 1/4" sheet metal screws. Make sure the hookup wires are pushed away from the screw holes in the chassis before tightening the screws.

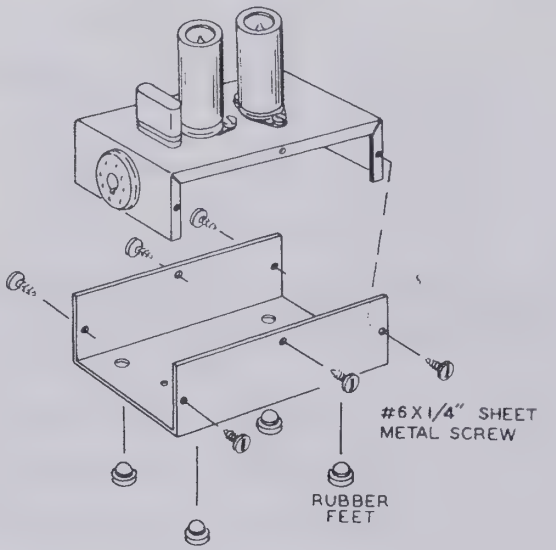
( ) Install the Receiver chassis into the cabinet.

ALTERNATE MOUNTING

Refer to Pictorial 8 for the following steps.

( ) Install the four rubber feet to the bottom of the chassis base.

( ) Install the chassis to the chassis base, using six #6 x 1/4" sheet metal screws. Make sure the hookup wires are pushed away from the screw holes in the chassis before tightening the screws.



PICTORIAL 8

CABLE HOOKUP

Refer to Pictorial 9 (fold-out from Page 22) for the following steps.

( ) Connect the power cable from the Converter to the Receiver socket.

( ) Connect the prepared shielded cable from the RCVR socket of the Converter to the VHF No. 1 socket of the SB-300 Receiver.

( ) Connect your 2-meter antenna to the ANT socket of the Converter.

Pictorial 9 shows all the cable connections for using the SBA-300-4, 2-Meter Converter with the SB-300 Receiver. Connections for the SBA-300-3, 6-Meter Converter (available as a separate kit) are shown by dotted lines.

OPERATION

IMAGE TRAP ADJUSTMENT

( ) Tune the receiver across the 2-meter band. If an IF image appears at the high or low end of the band (this would be an FM broadcast station near your locality), turn image trap adjustment C1 for minimum signal leak-through. If more than one image appears, adjust the image trap for minimum signal on the stronger image, or adjust the image trap between the two stronger signals.

ANTENNA TRIMMER ADJUSTMENT

( ) Adjust trimmer capacitor C2 for the best signal-to-noise ratio when tuned to a weak 2-meter signal.

Instrument alignment should not be required, as the previous adjustments of the coils and capacitors should provide Converter operation equal to or better than the specifications. In case you have the necessary equipment, and prefer instrument alignment, refer to Page 26 and 27 of this Manual.

CRYSTAL INFORMATION

The 38.66666 megacycle crystal supplied with the Converter provides reception from 144 to 146 megacycles. Other crystal frequencies can be used to cover different 2-megacycle segments between 142 and 150 megacycles. The following chart lists some of the crystal frequencies that can be used. In each case, the output frequency of the Converter is between 28 and 30 mc, which corresponds to 10-meter reception with the SB-300 Receiver.

CRYSTAL CHART

(Frequencies in megacycles)

CONVERTER CRYSTAL	COVERAGE
38	142 to 144
38.66666	144 to 146
39.33333	146 to 148
40	148 to 150

When purchasing a crystal for use with this Converter, you should specify the frequency and the following crystal characteristics. Crystals that do not have these characteristics will not provide optimum performance.

Load capacitance (C1):	19.1 $\mu\mu$f
Internal capacity (Co):	7 $\mu\mu$f, maximum
Series resistance (Rs):	30 Ω, maximum
Drive level:	10 millivolts
Mode of operation:	3rd overtone

Also, if you install a crystal other than the 38.66666 megacycle crystal supplied, it will be necessary to readjust oscillator coils L6 and L7 as directed in the Initial Test And Adjustment section of the manual.

INSTRUMENT ALIGNMENT

Instrument alignment of the Converter is not required for normal operation; however, if you have access to the necessary test equipment, complete instrument alignment will assure optimum performance. A signal generator that covers 142 to 150 megacycles and a vacuum tube voltmeter will be needed.

( ) Connect the vacuum tube voltmeter to the speaker terminals of the Receiver. Set the vacuum tube voltmeter to the 1.5 volt AC range.

( ) Set the SB-300 Receiver controls as follows:

AGC - OFF.
MODE - AM.
FUNCTION - OPR.
RF GAIN - Fully clockwise.
Slide rule dial - 1.
Circular dial - 0.
Converter switch - VHF No. 1.

( ) Unplug the antenna and connect the signal generator output to the Converter ANT socket.

( ) Set the signal generator for 30% modulation, and keep the signal output level at 3 microvolts during alignment.

Now align the Converter as directed in the Instrument Alignment Chart.

NOTE: The signal generator frequencies given in the Instrument Alignment Chart are for use with a 38.66666 megacycle crystal in the Converter. If you have a different frequency crystal in the Converter, it will be necessary to change the signal generator frequencies accordingly.

For example: Step 1 in the Instrument Alignment Chart calls for a signal generator frequency of 145.0 megacycles. If you are using a 40 megacycle crystal, you should set the signal generator to 147.0 megacycles (+2 megacycles).

INSTRUMENT ALIGNMENT CHART

	SB-300 BAND	SB-300 AF GAIN	SB-300 PRE-SELECTOR	SIGNAL GENERATOR (400 cps with 30% modulation)	SB-300 CIRCULAR DIAL	CONVERTER ADJUSTMENTS					
						L5	L6	L7	L3 and L4	C1	C2
1	29.0 MC	3/4 OF ROTATION	MAXIMUM VTVM READING (NOISE)	145.0 MC	MAXIMUM VTVM READING	MAXIMUM VTVM READING	ADJUST L6 AND SB-300 CIRCULAR DIAL FOR MAXIMUM VTVM READING	MAXIMUM VTVM READING			
2	28.0 MC	3/4 OF ROTATION	MAXIMUM VTVM READING (NOISE)	144.0 MC	MAXIMUM VTVM READING				ADJUST L3 FOR MAXIMUM VTVM READING		
3	30.0 MC	3/4 OF ROTATION	MAXIMUM VTVM READING (NOISE)	146.0 MC	MAXIMUM VTVM READING				ADJUST L4 FOR MAXIMUM VTVM READING		
4	28.25 MC	ADJUST FOR SOME REFERENCE LEVEL ON VTVM	MAXIMUM VTVM READING (NOISE)	144.25 MC	MAXIMUM VTVM READING				ADJUST L3 FOR MAXIMUM VTVM READING	REPEAT THESE TWO STEPS FOR MAXIMUM VTVM READINGS. READINGS SHOULD NOT VARY MORE THAN 3 TO 4 DB BETWEEN THESE TWO FREQUENCY SETTINGS.	
5	29.75 MC	DO NOT CHANGE OBSERVE READING ON VTVM	MAXIMUM VTVM READING (NOISE)	145.75 MC	MAXIMUM VTVM READING				ADJUST L4 FOR MAXIMUM VTVM READING		
6	29.0 MC	3/4 OF ROTATION	MAXIMUM VTVM READING (NOISE)	87 MC (GENERATOR AT MAXIMUM OUTPUT)	MAXIMUM VTVM READING					MINIMUM VTVM READING	
7	28.0 MC	3/4 OF ROTATION	MAXIMUM VTVM READING (NOISE)	DISCONNECT SIGNAL GENERATOR AND CONNECT ANTENNA	TUNE FOR ON-THE-AIR SIGNAL						ADJUST FOR BEST SIGNAL TO NOISE RATIO

IN CASE OF DIFFICULTY

NOTE: Refer to the Kit Builders Guide for Warranty information.

1. Recheck the wiring. Trace each lead in colored pencil on the Pictorial as it is checked. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something consistently overlooked by the constructor.

2. It is interesting to note that about 90% of the kits that are returned for repair, do not function properly due to poor connections and soldering. Therefore, many troubles can be eliminated by reheating all connections to make sure that they are soldered as described in the Proper Soldering Techniques section of this manual.

3. Check the values of the parts. Be sure that the proper part has been wired into the circuit, as shown in the pictorial diagrams and as called out in the wiring instructions.

4. Check for bits of solder, wire ends or other foreign matter which may be lodged in the wiring.

5. If, after careful checks, the trouble is still not located and a voltmeter is available, check voltage readings against those shown on the Schematic Diagram. NOTE: All voltage readings were taken with an 11 megohm input vacuum tube voltmeter. Voltages may vary as much as 10%.

6. A review of the Circuit Description will prove helpful in indicating where to look for trouble.

SERVICE INFORMATION

SERVICE

If, after applying the information in this manual and your best efforts, you are still unable to obtain proper performance, it is suggested that you take advantage of the technical facilities which the Heath Company makes available to its customers.

The Technical Consultation Department is maintained for your benefit. This service is available to you at no charge. Its primary purpose is to provide assistance for those who encounter difficulty in the construction, operation or maintenance of HEATHKIT equipment. It is not intended, and is not equipped to function as a general source of technical information involving kit modifications nor anything other than the normal and specified performance of HEATHKIT equipment.

Although the Technical Consultants are familiar with all details of this kit, the effectiveness of their advice will depend entirely upon the amount and the accuracy of the information furnished by you. In a sense, YOU MUST QUALIFY for GOOD technical advice by helping the consultants to help you. Please use this outline:

1. Before writing, fully investigate each of the hints and suggestions listed in this manual under In Case Of Difficulty. Possibly it will not be necessary to write.
2. When writing, clearly describe the nature of the trouble and mention all associated equipment. Specifically report operating procedures, switch positions, connections to other units, and anything else that might help to isolate the cause of trouble.
3. Report fully on the results obtained when testing the unit initially and when following the suggestions under In Case Of Difficulty. Be as specific as possible and include voltage readings if test equipment is available.
4. Identify the kit Model Number and Series Number, and date of purchase, if available. Also mention the date of the kit assembly manual. (Date at bottom of Page 1.)
5. Print or type your name and address, preferably in two places on the letter.

With the preceding information, the consultant will know exactly what kit you have, what you would like it to do for you and the difficulty you wish to correct. The date of purchase tells him whether or not engineering changes have been made since it was shipped to you. He will know what you have done in an effort to locate the cause of trouble and, thereby, avoid repetitious suggestions. In short, he will devote full time to the problem at hand, and through his familiarity with the kit, plus your accurate report, he will be able to give you a complete and helpful answer. If replacement parts are required, they will be shipped to you, subject to the terms of the Warranty.

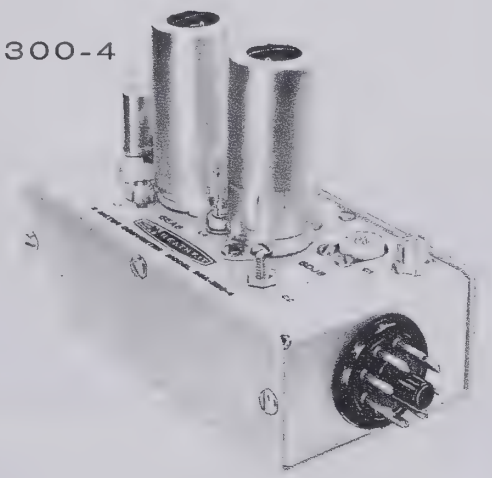
CONDENSED

Assembly and Operation of the

HEATHKIT

2-METER CONVERTER

MODEL SBA-300-4



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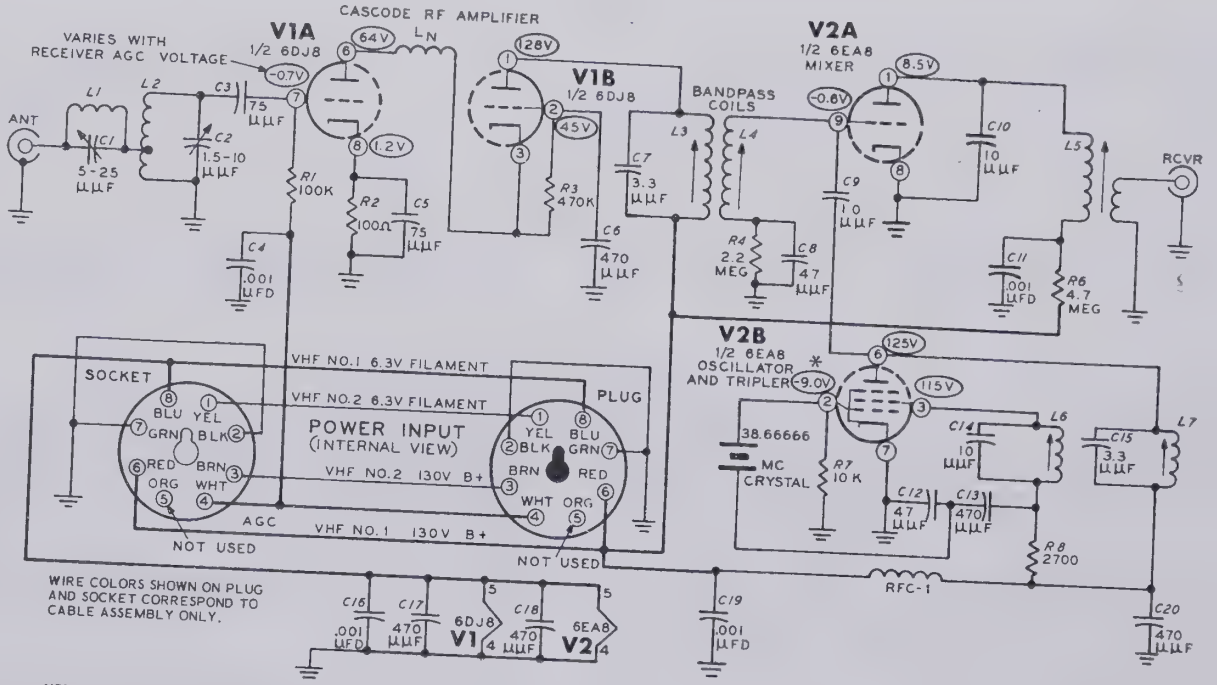
HEATH COMPANY

BENTON HARBOR, MICHIGAN

1-19-68

SPECIFICATIONS

Sensitivity. . . . . (Signal plus noise-to-noise in db)	AM: Less than 0.2 microvolt for 6 db at 3750 cps bandwidth SSB: Less than 0.2 microvolt for 12 db at 2100 cps bandwidth CW: Less than 0.2 microvolt for 20 db at 400 cps bandwidth (Using Heathkit SB-300 Receiver.)
Noise Figure.	7 db or less.
Bandpass.	Essentially flat over any 2 megacycle segment from 142 t 150 megacycles.
Frequency.	Input: 142 to 150 megacycles (144 to 146 megacycles wit crystal supplied). Output: 28 to 30 megacycles.
Image Rejection.	80 db or better at 88 megacycles.
IF Rejection.	50 db or better at 29 megacycles.
Crystal.	38.66666 megacycles ±.003%, 3rd overtone.
Tube Complement.	6DJ8 cascode RF amplifier. 6EA8 oscillator-tripler-mixer.
Power Requirements.	130 volts DC at 12.5 milliamperes. 6.3 volts AC at 815 milliamperes.



WIRE COLORS SHOWN ON PLUG AND SOCKET CORRESPOND TO CABLE ASSEMBLY ONLY.

NOTES:

ALL RESISTORS ARE 1/2 WATT.
ALL RESISTOR VALUES ARE IN OHMS (K = 1000, MEG = 1,000,000).
( ) INDICATES VOLTAGE READING.
ALL VOLTAGES ARE DC POSITIVE UNLESS MARKED OTHERWISE.
ALL VOLTAGES ARE MEASURED FROM POINT INDICATED TO CHASSIS GROUND AND MAY VARY ±10%.
VOLTAGE READINGS TAKEN WITH AN 11 MEGOHM VTVM, WITH NO SIGNAL INPUT.
POWER INPUT LINES LABLED VHF NO. 2 RECEIVE POWER WHEN RECEIVER CONVERTER SWITCH IS IN VHF NO. 2 POSITION.
POWER INPUT LINES LABLED VHF NO. 1 RECEIVE POWER WHEN RECEIVER CONVERTER SWITCH IS IN VHF NO. 1 POSITION.
* VARIES WITH CRYSTAL ACTIVITY.

SCHEMATIC OF THE HEATHKIT® 2-METER CONVERTER MODEL SBA-300-4

Dimensions	Overall: 2-5/8" wide x 5-3/4" long x 3-3/4" high.
Net Weight	10-1/2 oz.
Test Equipment Used In Preparing Specifications Measurements, And Alignment Instructions	Measurements Corporation Model 80 Standard Signal Generator (with 50 Ω pad). Heathkit Model IM-13 Vacuum Tube Voltmeter.

The Heath Company reserves the right to discontinue instruments and to change specifications at any time without incurring any obligation to incorporate new features in instruments previously sold.

INTRODUCTION

The Heathkit Model SBA-300-4, 2-Meter Converter is designed to extend the frequency coverage of the Heathkit SB-300 Receiver to include 142 to 150 megacycles (144 to 146 megacycles with the 38.66666 megacycle crystal supplied). The Converter receives its filament, B+, and AGC voltages from the receiver through a power cable. The power cable connections for the Converter are switched by the Converter switch in the SB-300 Receiver.

A separate power socket on the Converter chassis provides power for the Heathkit Model SBA-300-3, 6-Meter Converter. Either one or both of these converters can be mounted on the rear of the SB-300 Receiver cabinet for a neat, easy installation.

The Converter circuit consists of a cascode RF amplifier, a crystal-controlled oscillator-tripler, and a mixer stage. The 2-stage RF amplifier provides low noise, plus excellent sensitivity characteristics; the crystal-controlled oscillator provides drift-free operation.

Although this Converter is designed for use with the Heathkit SB-300 Receiver, it can be used equally well with any other receiver that has similar characteristics and tunes from 28 to 30 megacycles.

The SBA-300-4 Converter and SB-300 Receiver combination provides high-sensitivity, high-stability, and low-noise VHF reception of AM, SSB, and CW signals in the 2-meter band.

CIRCUIT DESCRIPTION

Refer to the Schematic Diagram while reading the following Circuit Description.

CASCODE RF AMPLIFIER

Tube stages V1A and V1B are connected as an untuned cascode RF amplifier; V1A is a grounded-cathode stage, and V1B is a grounded-grid stage. The signal from the antenna is coupled across image trap coil L1, input coil L2, and through coupling capacitor C3 to the grid of tube V1A. Image trap coil L1 is adjusted to reject signals at 88 megacycles, while allowing the desired operating frequencies to pass. Input coil L2 is tapped to provide a 50 Ω antenna input impedance.

In tube V1A, the signal is amplified and then coupled to the cathode of tube V1B through L_N. Tube stage V1A is neutralized by L_N for optimum signal-to-noise ratio. After further amplification in V1B, the signal is coupled through bandpass coils L3 and L4. These coils are placed physically close together so they operate as a transformer; L3 serves as the primary and L4 as the secondary of the transformer. This circuit presents a high impedance to 143-149 megacycle signal frequencies, and is almost a short circuit to any other received signal frequencies that may be amplified by the cascode RF amplifier.

MIXER-OSCILLATOR-TRIPLER

The signal from coil L4 is directly coupled to the grid of tube V2A, which is used as a low-noise mixer. The oscillator signal from V2B is also applied to the grid of mixer V2A. The incoming signal frequency and the oscillator frequency are mixed i V2A to produce an IF signal (28 to 30 megacycles). The plat circuit of V2A is tuned to the 29 megacycle IF midpoint by ca pacitor C10 and coil L5. The IF signal is coupled from coi L5 to the receiver antenna input by a link winding on coil L5 This coil provides a 50 Ω output impedance to match the re- ceiver antenna input impedance.

Tube V2B is a crystal-controlled oscillator stage. The gric and screen circuits of V2B form the oscillator. A 38.66666 megacycle 3rd overtone crystal, coil L6, and capacitor C14 control the oscillator frequency. The plate circuit is tuned to the third harmonic of the crystal frequency by coil L7 and capacitor C15. This 115.999 megacycle signal is coupled through capacitor C9 to the grid of mixer tube V2A. (The 38.66666 megacycle crystal provides coverage between 144 and 146 megacycles. A 38, 39.333, or 40 megacycle crystal may also be used to cover 2 megacycle segments below and above the 144 to 146 megacycle range.)

POWER

Filament, B+, and AGC voltages are provided by the receiver through a cable assembly. The VHF No. 1 position of the SB-300 Receiver Converter switch applies power to the Converter through lugs 6 and 8 of the plug and socket. In the VHF No. 2 position, power is applied through lugs 1 and 3 of the octal plug and socket for use with a 6-Meter Converter. AGC voltage is applied through lug 4 and is not switched.

PARTS LIST

The numbers in parentheses in the Parts List are keyed to the numbers on the Parts Pictorial to aid in parts identification.

PART No.	PARTS Per Kit	DESCRIPTION
RESISTORS-1/2 WATT		
(1) 2-149	1	.900 Ω precision
(2) 1-3	1	100 Ω (brown-black-brown)
1-13	1	2700 Ω (red-violet-red)
1-20	1	10 KΩ (brown-black-orange)
1-26	1	100 KΩ (brown-black-yellow)
1-33	1	470 KΩ (yellow-violet-yellow)
1-37	1	2.2 megohm (red-red-green)
1-39	1	4.7 megohm (yellow-violet-green)
CAPACITORS		
(3) 21-33	2	3.3 μμf disc
21-3	2	10 μμf disc
21-32	2	47 μμf disc
21-54	2	75 μμf disc
21-56	5	470 μμf disc
21-14	4	.001 μfd disc
(4) 28-2	1	1.0 μμf tubular (brown-black-white)
(5) 31-17	1	5-25 μμf trimmer
(6) 31-21	1	1.5 - 10 μμf ceramic trimmer

PART No.	PARTS Per Kit	DESCRIPTION
COILS		
(7) 40-203	2	Bandpass (with lockwasher and nut)
(8) 40-209	1	Image trap
(9) 40-326	1	RF
(10) 40-612	1	Multiplier
40-622	1	Oscillator
40-623	1	Output
(11) 45-37	1	Choke
HARDWARE		
Screws		
(12) 250-170	6	#6 x 1/4" sheet metal
(13) 250-49	7	3-48 x 1/4"
(14) 250-133	1	3-48 x 7/16"
(15) 250-89	2	6-32 x 3/8"
(16) 250-134	1	6-32 x 3/4"
Nuts		
(17) 252-1	8	3-48
(18) 252-3	2	6-32
(19) 252-19	1	6-32 palnut

HEATHKIT

PART No.	PARTS Per Kit	DESCRIPTION
Lockwashers		
(20) 254-7	14	#3
(21) 254-1	2	#6
(22) 254-14	2	1/4"
Miscellaneous		
(23) 259-6	5	#6 solder lug
(24) 260-29	1	Crystal clip
(25) 435-1	2	Mounting ring
WIRE-CABLES		
344-59	1	Hookup wire
347-1	1	8-wire cable
343-2	1	Shielded cable
CRYSTAL-TUBES		
404-250	1	38.66666 mc crystal
411-124	1	6EA8 tube
411-208	1	6DJ8 tube

PART No.	PARTS Per Kit	DESCRIPTION
TERMINAL STRIP-SOCKETS-PLUGS		
431-49	1	11-lug terminal strip
(26) 434-4	2	Octal socket
(27) 434-36	2	9-pin tube socket
(28) 434-74	1	Crystal socket
(29) 434-107	2	Phono socket
(30) 438-4	3	Phono plug
(31) 438-6	2	Octal plug
MISCELLANEOUS		
206-3	2	Tube shield
261-4	4	Rubber feet
200-420-2	1	Chassis
201-32	1	Chassis base
(32) 440-1	2	Octal plug cap
490-1	1	Alignment tool
331-6		Solder
595-712	1	Manual

Refer to Pictorial 6 for the following steps.

( ) Locate the length of 8-wire cable and prepare each end as shown in the Pictorial.

( ) Remove 1/4" of insulation from the end of each inner wire and apply a small amount of solder to the bared ends. This will hold the small wire strands together.

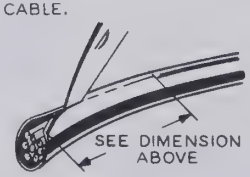
( ) Place an octal cap over each cable end, then connect the wires at each end of the cable to the octal socket and plug as shown.

( ) Check all the connections at each end of the cable. Be sure none of them are shorted out due to solder splashes.

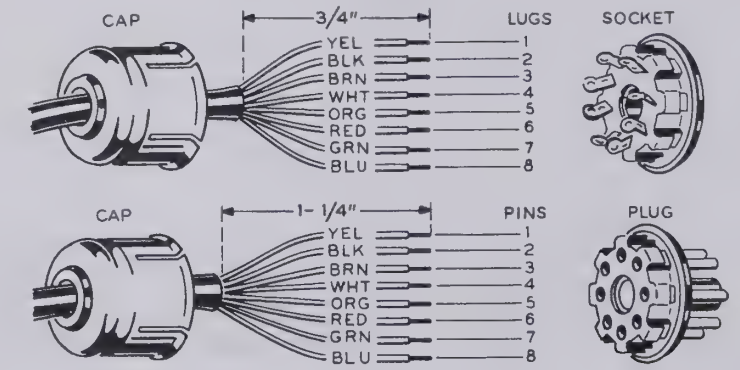
( ) Snap the caps onto the octal plug and socket.

( ) Set this cable aside to be used later.

TAKING CARE NOT TO CUT THE INNER LEADS REMOVE THE OUTER INSULATION OF THE CABLE.



REMOVE 1/4" OF INSULATION FROM THE END OF EACH INNER LEAD. APPLY A SMALL AMOUNT OF SOLDER TO THE BARED WIRE ENDS. THEN CONNECT THE LONGER LEADS TO THE OCTAL PLUG AND THE SHORTER LEADS TO THE OCTAL SOCKET AS FOLLOWS.



PICTORIAL 6

INITIAL TEST AND ADJUSTMENT

NOTE: This Converter was designed for use with the Heathkit SB-300 Receiver, but it can also be used with other receivers that tune the 10-meter band, and provide suitable filament, B+, and AGC voltages. These voltages should be connected to the octal plug of the power cable as follows:

Pin 8 Filament, 6.3 volts at 815 milliamperes.
Pin 2 Ground.
Pin 6 B+, 130 volts at 12.5 milliamperes.
Pin 4 AGC 0.7 to 9.0 volts (-DC).
Pin 7 Ground.

The following adjustments are made with the Converter connected to a Heathkit SB-300 Receiver that is operating, and properly aligned. An 11 megohm input VTVM will be needed for some of these adjustments.

( ) Set the SB-300 Receiver front panel controls as follows:

AGC - OFF.
MODE - AM.
FUNCTION - STBY.
BAND - 28.5.
AF GAIN - Fully counterclockwise.
RF GAIN - Fully clockwise.
SLIDE RULE DIAL - On 1.
CIRCULAR DIAL - On 0.

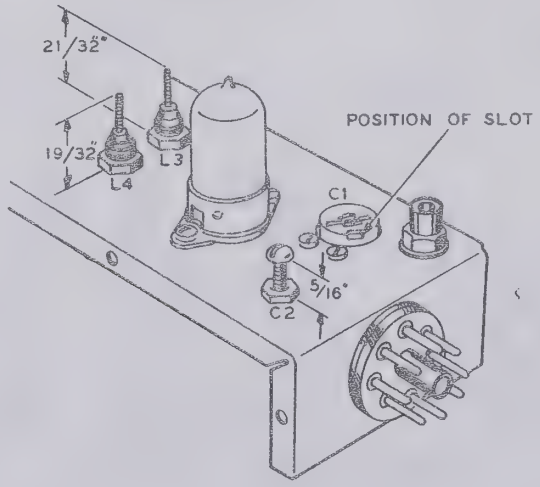
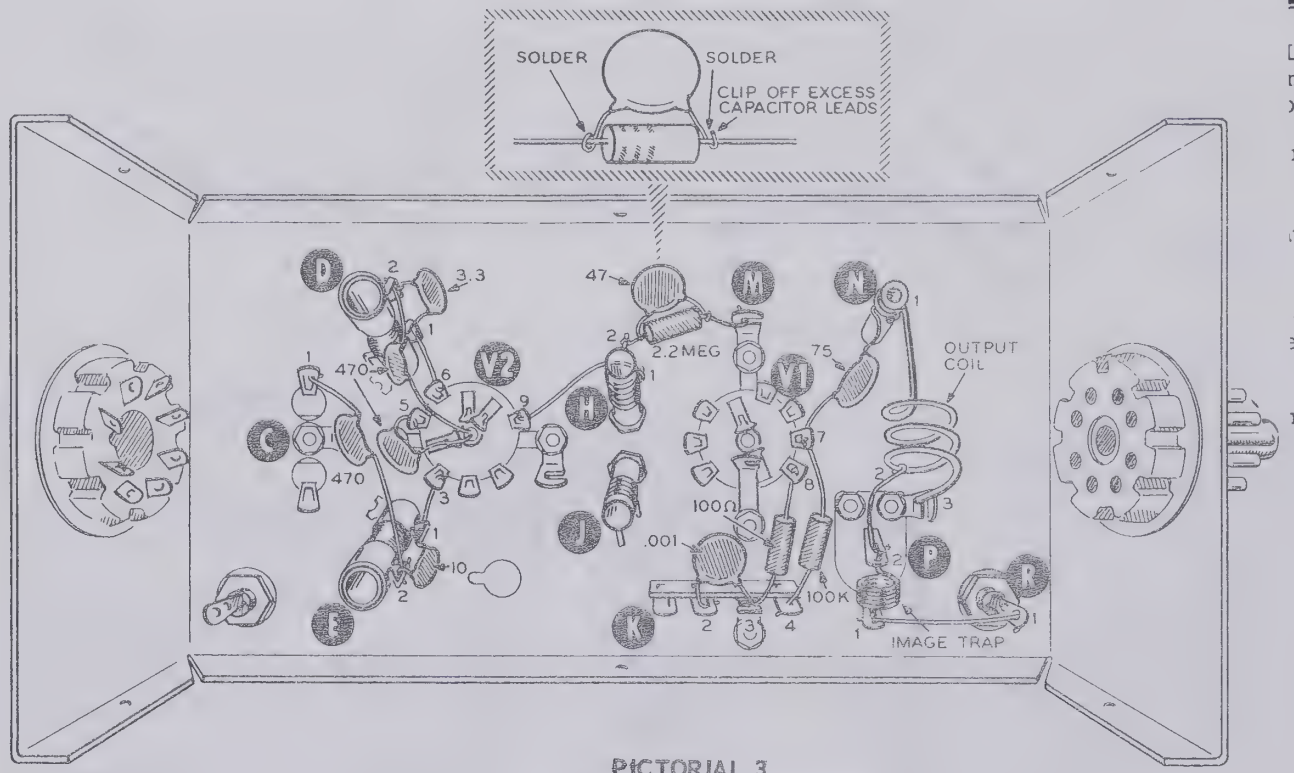


Figure 1

( ) Referring to Figure 1, preset coils L3 and L4, and capacitors C1 and C2 as shown.

( ) Connect the power cable prepared previously, from the Receiver socket to the Converter plug.


SOLDER
SOLDER
CLIP OFF EXCESS CAPACITOR LEADS
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1
V2
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9
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10
2
E
47
M
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2.2MEG
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IMAGE TRAP

PICTORIAL 3

NOTE:
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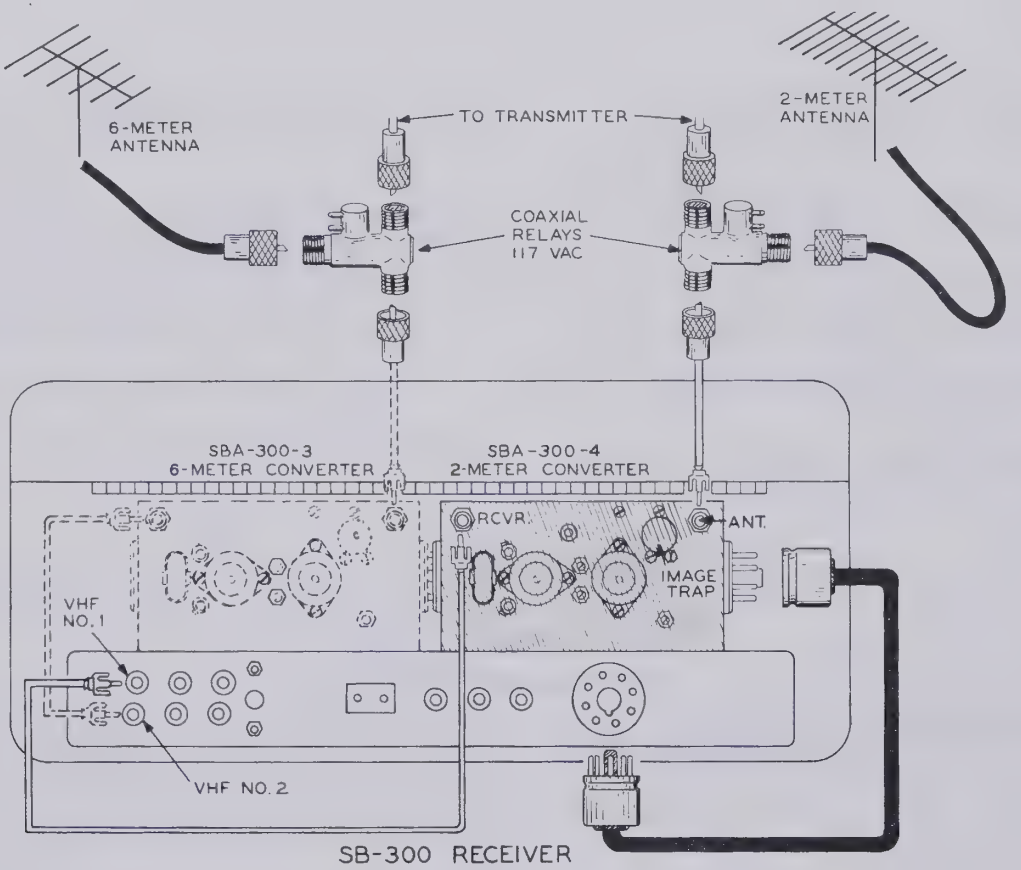


PICTORIAL 9

( ) Set the Receiver Converter switch to VHF No. 1. With the Converter switch in this position, filament and B+ voltages are applied to the Converter. The filaments of the Converter tubes should light.

( ) If there is any sign of overheating components, turn the Receiver Converter switch to the HF position to remove filament and B+ voltages from the Converter. If no difficulty is encountered, proceed with the following steps.

( ) Install the tube shields over the Converter tubes.

( ) Set the Receiver Function switch to OPR (operate).

( ) Set the VTVM to read -DC volts on the 15 volt or higher range.

( ) Connect the DC probe of the VTVM to lug 2 of coil L4 (coil H) and connect the common VTVM lead to the Converter chassis. Refer to Pictorial 3 for the coil lug location.

( ) Using the alignment tool supplied, adjust oscillator coils L6 and L7 for a maximum VTVM reading.

( ) Disconnect the VTVM test leads from the Converter.

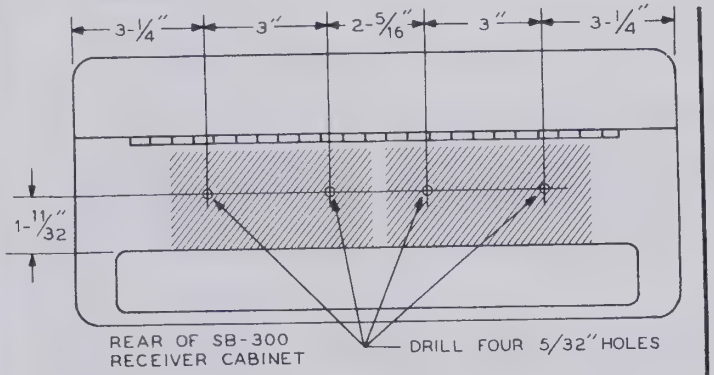
( ) Set the Receiver Function switch to OFF.

( ) Disconnect the Converter power cable from the Receiver socket.

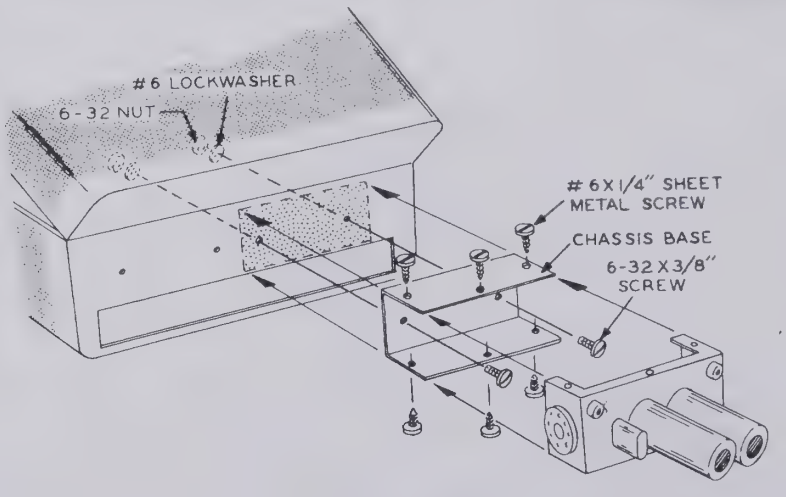
This completes the Initial Test and Adjustment of the Converter. Proceed with the Installation section.

INSTALLATION

NOTE: Permanent and Alternate Mounting instructions are given. Use the permanent mounting section if you prefer to have the Converter attached to the rear of your SB-300 Receiver; if you do not want the Converter attached to the Receiver, use the Alternate Mounting section.



Detail 7A



PICTORIAL 7

PERMANENT MOUNTING

NOTE: Some early model SB-300 Receiver Cabinets do not have holes in the back of the cabinet for the Converter installation. If your cabinet does not have these holes, use Detail 7A to locate and drill the holes needed for Converter mounting. Be sure to remove the receiver from the cabinet before drilling the holes.

Refer to Pictorial 7 for the following steps.

( ) Install the chassis base to the rear of the receiver cabinet. Use two 6-32 x 3/8" screws, #6 lockwashers, and 6-32 nuts.

( ) Install the chassis to the chassis base, using six #6 x 1/4" sheet metal screws. Make sure the hookup wires are pushed away from the screw holes in the chassis before tightening the screws.

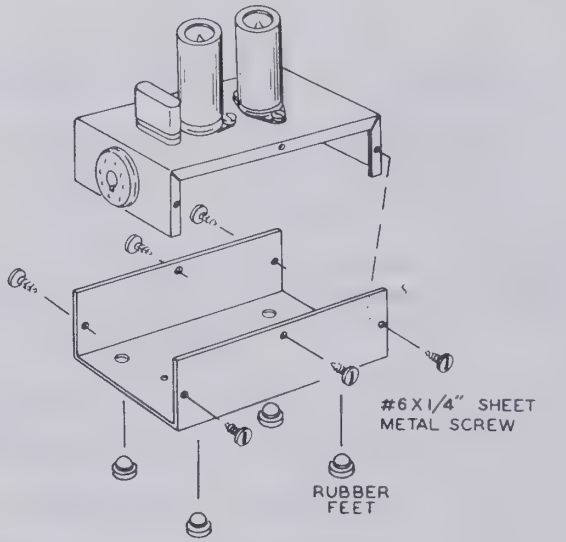
( ) Install the Receiver chassis into the cabinet.

ALTERNATE MOUNTING

Refer to Pictorial 8 for the following steps.

( ) Install the four rubber feet to the bottom of the chassis base.

( ) Install the chassis to the chassis base, using six #6 x 1/4" sheet metal screws. Make sure the hookup wires are pushed away from the screw holes in the chassis before tightening the screws.



PICTORIAL 8

CABLE HOOKUP

Refer to Pictorial 9 (fold-out from Page 22) for the following steps.

( ) Connect the power cable from the Converter to the Receiver socket.

( ) Connect the prepared shielded cable from the RCVR socket of the Converter to the VHF No. 1 socket of the SB-300 Receiver.

( ) Connect your 2-meter antenna to the ANT socket of the Converter.

Pictorial 9 shows all the cable connections for using the SBA-300-4, 2-Meter Converter with the SB-300 Receiver. Connections for the SBA-300-3, 6-Meter Converter (available as a separate kit) are shown by dotted lines.

OPERATION

IMAGE TRAP ADJUSTMENT

( ) Tune the receiver across the 2-meter band. If an IF image appears at the high or low end of the band (this would be an FM broadcast station near your locality), turn image trap adjustment C1 for minimum signal leak-through. If more than one image appears, adjust the image trap for minimum signal on the stronger image, or adjust the image trap between the two stronger signals.

ANTENNA TRIMMER ADJUSTMENT

( ) Adjust trimmer capacitor C2 for the best signal-to-noise ratio when tuned to a weak 2-meter signal.

Instrument alignment should not be required, as the previous adjustments of the coils and capacitors should provide Converter operation equal to or better than the specifications. In case you have the necessary equipment, and prefer instrument alignment, refer to Page 26 and 27 of this Manual.

CRYSTAL INFORMATION

The 38.66666 megacycle crystal supplied with the Converter provides reception from 144 to 146 megacycles. Other crystal frequencies can be used to cover different 2-megacycle segments between 142 and 150 megacycles. The following chart lists some of the crystal frequencies that can be used. In each case, the output frequency of the Converter is between 28 and 30 mc, which corresponds to 10-meter reception with the SB-300 Receiver.

CRYSTAL CHART

(Frequencies in megacycles)

CONVERTER CRYSTAL	COVERAGE
38	142 to 144
38.66666	144 to 146
39.33333	146 to 148
40	148 to 150

When purchasing a crystal for use with this Converter, you should specify the frequency and the following crystal characteristics. Crystals that do not have these characteristics will not provide optimum performance.

Load capacitance (C1):	19.1 $\mu\mu$f
Internal capacity (Co):	7 $\mu\mu$f, maximum
Series resistance (Rs):	30 Ω, maximum
Drive level:	10 millivolts
Mode of operation:	3rd overtone

Also, if you install a crystal other than the 38.66666 megacycle crystal supplied, it will be necessary to readjust oscillator coils L6 and L7 as directed in the Initial Test And Adjustment section of the manual.

INSTRUMENT ALIGNMENT

Instrument alignment of the Converter is not required for normal operation; however, if you have access to the necessary test equipment, complete instrument alignment will assure optimum performance. A signal generator that covers 142 to 150 megacycles and a vacuum tube voltmeter will be needed.

( ) Connect the vacuum tube voltmeter to the speaker terminals of the Receiver. Set the vacuum tube voltmeter to the 1.5 volt AC range.

( ) Set the SB-300 Receiver controls as follows:

AGC - OFF.
MODE - AM.
FUNCTION - OPR.
RF GAIN - Fully clockwise.
Slide rule dial - 1.
Circular dial - 0.
Converter switch - VHF No. 1.

( ) Unplug the antenna and connect the signal generator output to the Converter ANT socket.

( ) Set the signal generator for 30% modulation, and keep the signal output level at 3 microvolts during alignment.

Now align the Converter as directed in the Instrument Alignment Chart.

NOTE: The signal generator frequencies given in the Instrument Alignment Chart are for use with a 38.66666 megacycle crystal in the Converter. If you have a different frequency crystal in the Converter, it will be necessary to change the signal generator frequencies accordingly.

For example: Step 1 in the Instrument Alignment Chart calls for a signal generator frequency of 145.0 megacycles. If you are using a 40 megacycle crystal, you should set the signal generator to 147.0 megacycles (+2 megacycles).

INSTRUMENT ALIGNMENT CHART

	SB-300 BAND	SB-300 AF GAIN	SB-300 PRE-SELECTOR	SIGNAL GENERATOR (400 cps with 30% modulation)	SB-300 CIRCULAR DIAL	CONVERTER ADJUSTMENTS					
						L5	L6	L7	L3 and L4	C1	C2
1	29.0 MC	3/4 OF ROTATION	MAXIMUM VTVM READING (NOISE)	145.0 MC	MAXIMUM VTVM READING	MAXIMUM VTVM READING	ADJUST L6 AND SB-300 CIRCULAR DIAL FOR MAXIMUM VTVM READING	MAXIMUM VTVM READING			
2	28.0 MC	3/4 OF ROTATION	MAXIMUM VTVM READING (NOISE)	144.0 MC	MAXIMUM VTVM READING				ADJUST L3 FOR MAXIMUM VTVM READING		
3	30.0 MC	3/4 OF ROTATION	MAXIMUM VTVM READING (NOISE)	146.0 MC	MAXIMUM VTVM READING				ADJUST L4 FOR MAXIMUM VTVM READING		
4	28.25 MC	ADJUST FOR SOME REFERENCE LEVEL ON VTVM	MAXIMUM VTVM READING (NOISE)	144.25 MC	MAXIMUM VTVM READING				ADJUST L3 FOR MAXIMUM VTVM READING	REPEAT THESE TWO STEPS FOR MAXIMUM VTVM READINGS. READINGS SHOULD NOT VARY MORE THAN 3 TO 4 DB BETWEEN THESE TWO FREQUENCY SETTINGS.	
5	29.75 MC	DO NOT CHANGE OBSERVE READING ON VTVM	MAXIMUM VTVM READING (NOISE)	145.75 MC	MAXIMUM VTVM READING				ADJUST L4 FOR MAXIMUM VTVM READING		
6	29.0 MC	3/4 OF ROTATION	MAXIMUM VTVM READING (NOISE)	87 MC (GENERATOR AT MAXIMUM OUTPUT)	MAXIMUM VTVM READING					MINIMUM VTVM READING	
7	28.0 MC	3/4 OF ROTATION	MAXIMUM VTVM READING (NOISE)	DISCONNECT SIGNAL GENERATOR AND CONNECT ANTENNA	TUNE FOR ON-THE-AIR SIGNAL						ADJUST FOR BEST SIGNAL TO NOISE RATIO

IN CASE OF DIFFICULTY

NOTE: Refer to the Kit Builders Guide for Warranty information.

1. Recheck the wiring. Trace each lead in colored pencil on the Pictorial as it is checked. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something consistently overlooked by the constructor.

2. It is interesting to note that about 90% of the kits that are returned for repair, do not function properly due to poor connections and soldering. Therefore, many troubles can be eliminated by reheating all connections to make sure that they are soldered as described in the Proper Soldering Techniques section of this manual.

3. Check the values of the parts. Be sure that the proper part has been wired into the circuit, as shown in the pictorial diagrams and as called out in the wiring instructions.

4. Check for bits of solder, wire ends or other foreign matter which may be lodged in the wiring.

5. If, after careful checks, the trouble is still not located and a voltmeter is available, check voltage readings against those shown on the Schematic Diagram. NOTE: All voltage readings were taken with an 11 megohm input vacuum tube voltmeter. Voltages may vary as much as 10%.

6. A review of the Circuit Description will prove helpful in indicating where to look for trouble.

SERVICE INFORMATION

SERVICE

If, after applying the information in this manual and your best efforts, you are still unable to obtain proper performance, it is suggested that you take advantage of the technical facilities which the Heath Company makes available to its customers.

The Technical Consultation Department is maintained for your benefit. This service is available to you at no charge. Its primary purpose is to provide assistance for those who encounter difficulty in the construction, operation or maintenance of HEATHKIT equipment. It is not intended, and is not equipped to function as a general source of technical information involving kit modifications nor anything other than the normal and specified performance of HEATHKIT equipment.

Although the Technical Consultants are familiar with all details of this kit, the effectiveness of their advice will depend entirely upon the amount and the accuracy of the information furnished by you. In a sense, YOU MUST QUALIFY for GOOD technical advice by helping the consultants to help you. Please use this outline:

1. Before writing, fully investigate each of the hints and suggestions listed in this manual under In Case Of Difficulty. Possibly it will not be necessary to write.
2. When writing, clearly describe the nature of the trouble and mention all associated equipment. Specifically report operating procedures, switch positions, connections to other units, and anything else that might help to isolate the cause of trouble.
3. Report fully on the results obtained when testing the unit initially and when following the suggestions under In Case Of Difficulty. Be as specific as possible and include voltage readings if test equipment is available.
4. Identify the kit Model Number and Series Number, and date of purchase, if available. Also mention the date of the kit assembly manual. (Date at bottom of Page 1.)
5. Print or type your name and address, preferably in two places on the letter.

With the preceding information, the consultant will know exactly what kit you have, what you would like it to do for you and the difficulty you wish to correct. The date of purchase tells him whether or not engineering changes have been made since it was shipped to you. He will know what you have done in an effort to locate the cause of trouble and, thereby, avoid repetitious suggestions. In short, he will devote full time to the problem at hand, and through his familiarity with the kit, plus your accurate report, he will be able to give you a complete and helpful answer. If replacement parts are required, they will be shipped to you, subject to the terms of the Warranty.